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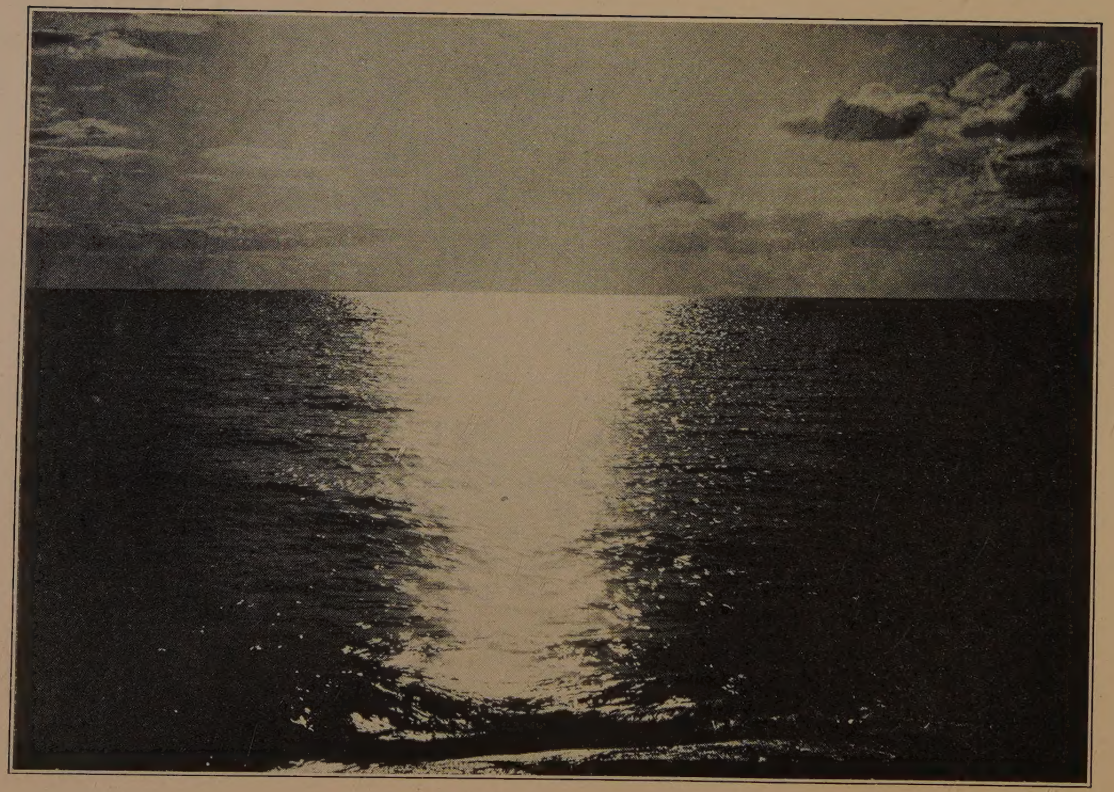

SUNSET ON THE LAKE OF THE WOODS.

FINAL REPORT

OF THE

INTERNATIONAL JOINT COMMISSION

ON THE

LAKE OF THE WOODS REFERENCE

▽

WASHINGTON–OTTAWA

WASHINGTON
GOVERNMENT PRINTING OFFICE
1917

INTERNATIONAL JOINT COMMISSION.

UNITED STATES.	CANADA.
OBADIAH GARDNER, Chairman.	CHARLES A. MAGRATH, Chairman.
JAMES A. TAWNEY.	HENRY A. POWELL, K. C.
R. B. GLENN.	P. B. MIGNAULT, K. C.
WHITEHEAD KLUTTZ, *Secretary.*	LAWRENCE J. BURPEE, *Secretary.*

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LETTER OF TRANSMITTAL.

JUNE 12, 1917.

SIR: We have the honor to inclose herewith the Final Report of the International Joint Commission in the matter of the reference of June 27, 1912, submitted by the Governments of the United States and of the Dominion of Canada, under the provisions of Article IX of the treaty of January 11, 1909, between the United States and Great Britain.

We have the honor to be, sir, your obedient servants,

WHITEHEAD KLUTTZ,
LAWRENCE J. BURPEE,
Secretaries.

The honorable the SECRETARY OF STATE,
Washington, D. C.

46232

LETTER OF REFERENCE.

Identical letters of reference on behalf of the Governments of the United States and the Dominion of Canada, dated June 27, 1912, were addressed to the International Joint Commission as follows:

I have the honor to inform you that at the request of the Government of the United States and of the Government of the Dominion of Canada, under the provisions of Article IX of the treaty of January 11, 1909, between the United States and Great Britain, the questions or matters of difference set forth below, which have arisen between them involving the rights, obligations, or interests of each in relation to the other, or to the inhabitants of the other, along their common frontier between the United States and the Dominion of Canada, are hereby referred to the International Joint Commission for examination and report upon the facts and circumstances of the particular questions and matters referred together with such conclusions and recommendations as may be appropriate.

The questions so referred are as follows, namely:

(1) In order to secure the most advantageous use of the waters of the Lake of the Woods and of the waters flowing into and from the lake on each side of the boundary for domestic and sanitary purposes, for navigation and transportation purposes, for fishing purposes, and for power and irrigation purposes, and also in order to secure the most advantageous use of the shores and harbors of the lake and of the waters flowing into and from the lake, is it practicable and desirable to maintain the surface of the lake during the different seasons of the year at a certain stated level, and if so at what level?

(2) If a certain stated level is recommended in answer to question No. 1, and if such level is higher than the normal or natural level of the lake, to what extent, if at all, would the lake, when maintained at such level, overflow the lowlands upon its southern border, or elsewhere on its border, and what is the value of the lands which would be submerged?

(3) In what way or manner, including the construction and operation of dams or other works at the outlets and inlets of the lake, or in the waters which are directly or indirectly tributary to the lake, or otherwise, is it possible and advisable to regulate the volume, use, and outflow of the waters of the lake so as to maintain the level recommended in answer to question 1, and by what means or arrangement can the proper construction and operation of regulating works, or a system or method of regulation, be best secured and maintained in order to insure the adequate protection and development of all the interests involved on both sides of the boundary, with the least possible damage to all rights and interests, both public and private, which may be affected by maintaining the proposed level?

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NOTE RE DATUM.

"Sea-level datum" wherever referred to in this report is the datum adopted by the consulting engineers in their report and represents the sea-level datum of the United States Coast and Geodetic Survey (1912 adjustment). This datum is permanently established by the International Joint Commission bench mark at Warroad, Minnesota, a diagram of which appears on page 105 of the Engineers' Report (text) and which on page 101 of that report is described as follows:

International Joint Commission B. M. in school yard. Top of copper plug in concrete block, carried below frost line, and located near fence in front of and to the west of new schoolhouse. Established October 3, 1912. Elevation, sea-level datum, 1068.797.

By means of carefully executed, simultaneous readings of hook gauges at different points on the Lake of the Woods on March 12 to 14, 1914, while the lake was covered with ice, this datum was transferred from Warroad to Kenora and other points on the lake and there referred to permanent bench marks also described in the report of the consulting engineers.

"Public Works of Canada datum" on Rainy Lake and on the lakes above Kettle Falls is established by what is known as the "500" bench mark described on page 91 of the Engineers' Report (text), as follows:

Department of Public Works, Canada, B. M. top of iron bolt set vertically in solid rock, 4 feet from edge of north side of canal, directly beneath the Canadian end of the Minnesota & Ontario Power Company's bridge:
Elevation, public works, Canada, datum, 500.00.
Elevation, sea-level datum, 1111.61.

Other permanent bench marks at Fort Frances, Ontario, and International Falls, and Ranier, Minnesota, are described on page 91 of the Report of the Consulting Engineers.

FINAL REPORT OF THE INTERNATIONAL JOINT COMMISSION ON THE LAKE OF THE WOODS REFERENCE.

I.—INTRODUCTION.

The treaty between the United States and Great Britain, signed January 11, 1909, was concluded by the high contracting parties not only "to prevent disputes regarding the use of boundary waters," but also, among other things, "to settle all questions which are now pending between the United States and the Dominion of Canada, involving the rights, obligations, or interests of either in relation to the other or to the inhabitants of the other, along their common frontier, and to make provision for the adjustment and settlement of all such questions as may hereafter arise."

Scope of reference.

The foregoing reference submitted jointly by the Governments of the United States and of the Dominion of Canada under Article IX of said treaty sets forth certain "questions or matters of difference . . . which have arisen between" the two Governments, and which involve "the rights, obligations, or interests" of each Government "in relation to the other, or to the inhabitants of the other, along their common frontier." The reference then requests this commission, without expressly stating "any restrictions or exceptions" of any kind, to examine and report upon the "facts and circumstances of the particular questions and matters referred, together with such conclusions and recommendations as may be appropriate."

In the judgment of the commission, the reference calls for a report upon all matters pertaining to the regulation of the levels of the Lake of the Woods and the advantageous use of its waters, shores, and harbors, and the use of the water flowing into and from the lake, and the effect of such regulation on all public and private interests involved. It is also the judgment of the commission that the advantageous use of the waters about which the questions of the reference center includes not only all practicable uses to which these waters can be put on their own watershed, but also all beneficial uses which the energy developed thereon may serve in the adjacent territory. In the investigation and study of the questions referred, the commission has obtained much interesting data bearing upon the Lake of the Woods region. Most of it relates to the subject matter of the

reference. It is all of value, and the historical part will be found of great interest. The commission, therefore, caused it to be arranged and compiled, and submits it as a supplement hereto.

Technical investigations.

A reply to the questions of the reference and the complex and interdependent problems which it presents, involved extensive field surveys and the collection, analysis, and coordination of a vast amount of physical data. The extent and magnitude of the area to be covered in this investigation and the difficulties surrounding the field work, may be better understood from the fact that the superficial area of the Lake of the Woods, including Shoal Lake, is 1,485 square miles, or about 400 square miles greater than that of the State of Rhode Island. The entire drainage area of this lake and its tributary waters is 26,750 square miles, an area 5,000 square miles greater than that of Nova Scotia, and greater than the combined areas of the States of New Hampshire, Massachusetts, Rhode Island, Connecticut, and Delaware. As most of the area that had to be surveyed in detail was the lowland subject to past or possible future flooding, and as most of this land was swamp, marsh, or bog, the difficulties encountered in the field work are manifest. Nevertheless this work was carried on without reference to unfavorable climatic or other conditions, and was prosecuted with all possible dispatch and at the least possible cost.

In view of the Lake of the Woods and its tributary waters being one of the important links in the system of international boundary waters, the commission recognized the desirability of dealing with the questions involved in the reference on broad and comprehensive lines. To that end it felt that all data affecting this vast watershed should be collected, sifted, and tabulated, so as to have available in serviceable form all dependable information bearing upon these waters, not only for the purposes of fully answering the questions of the reference, but for future use in the regulation of these waters.

Prior to the reference, the only surveys in the Lake of the Woods watershed were the ordinary public-land surveys, and they did not extend over the entire area. There were no detailed topographic or hydrographic maps available covering the shore line of any of these waters. Additional hydrometric data were likewise required. Maps, plates, and graphs had to be prepared, so that the relevant physical data could be properly presented.

This part of the investigation has been carried on under the immediate supervision of Mr. Adolph F. Meyer, of Minneapolis, Minnesota, and Mr. Arthur V. White, of Toronto, Ontario, whom the commission appointed as its consulting engineers October 1, 1912. The services of these gentlemen and those employed under them have been eminently satisfactory to the commission and to all public and private interests concerned. They performed their duties with marked ability and untiring energy. The commission's opinion in this respect

is borne out by the testimony of all the engineers appearing before the commission who had studied their report in connection with this investigation.

Acknowledgments.

The commission desires, further, to acknowledge its appreciation of the valuable services rendered by the Dominion Water Power Branch and the Department of Public Works of Canada; the United States Geological Survey; the Corps of Engineers, United States War Department; and other governmental departments and individuals in both countries.[1]

Engineers' report.

Most of the data assembled and prepared by the engineers are presented in their report to the commission in three volumes, which is herewith submitted and made a part hereof. There is also submitted an atlas, consisting of 41 maps, together with a map of the entire watershed drawn on a scale of 7.89 miles to the inch. An examination of this atlas, as well as of the two volumes of plates and tables prepared by the consulting engineers, will at once reveal the commission's appreciation of the importance of thoroughly assembling, in a manner worthy of the two countries, all the essential facts fundamental to a clear understanding of the problems presented by the reference, and to the satisfactory regulation of these waters.

In connection with the watershed map, attention is particularly drawn to what seems to the commission a notable and significant fact. Perhaps for the first time in history two nations are being furnished by a commission, created to protect and conserve their mutual interests, with a very complete and accurate international map representing, without regard to political boundaries, the limits and details of a great and important watershed.

Public hearings.

In addition to the technical investigations conducted by the consulting engineers, the commission held public hearings at a number of conveniently located towns in the vicinity of the Lake of the Woods for the purpose of securing all possible information from the interested parties who desired to be heard upon the question of the use and control of the waters of the Lake of the Woods and its main tributary, Rainy River and Rainy Lake; and upon the question of the value of riparian lands which might be affected by the establishment of any proposed level for the Lake of the Woods. The evidence thus obtained, consisting of about 1,300 pages, is likewise submitted as a part of this report.

Some time after the public hearings, counsel for all parties in interest presented briefs and oral arguments in support of their respective contentions. Printed copies of all such briefs filed with the commission and oral arguments consisting of about 300 pages likewise accompany this report.

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[1] See Report of Consulting Engineers (text), pp. 14, 15.

II.—SUMMARY OF PHYSICAL CONDITIONS.

The Lake of the Woods, including Shoal Lake, is an irregularly shaped body of water 1,485 square miles in area. The southerly portion, formerly known as the Lake of the Woods and bordered by low shores, is an expanse of relatively shallow, open water about 30 miles across, now known as the Big Traverse. The northerly portion, known as the Little Traverse, is dotted with thousands of wooded islands.

The Lake of the Woods derives its water supply from a drainage area of 26,750 square miles, of which 42 per cent is in the United States and 58 per cent in Canada. The water surface of this drainage area—an intricate network of lakes, largely rockbound, with connecting streams—is 3,960 square miles, of which about 70 per cent lies within Canada and 30 per cent within the United States.

It will be observed by reference to the watershed map that the principal drainage course of the water tributary to the Lake of the Woods is along the boundary between the two countries and the general direction of the flow is northwesterly. The southeastern extremity of the drainage basin extends to within 15 miles of Lake Superior, where the divide has an elevation of approximately 1,800 feet above sea level datum. After leaving the Lake of the Woods, the waters flow down the Winnipeg River into Lake Winnipeg and thence by way of Nelson River to Hudson Bay.

This vast drainage basin may be conveniently divided into three main sections, namely: the Upper Rainy watershed, embracing all territory drained by the waters discharging out of Rainy Lake through Rainy River, and containing an area of 14,500 square miles; the Lower Rainy watershed, containing an area of 6,350 square miles; and finally, the watershed of the Lake of the Woods proper, embracing territory drained into that lake other than through Rainy River, and containing an area of 5,900 square miles. Through these waters from their source westward to the Northwest Angle, a distance of about 340 miles, the boundary between the United States and Canada passes.

Fully 60 per cent of the waters discharged out of the Lake of the Woods are received from the Upper Rainy watershed. Rainy Lake, at the foot of this watershed, has a mean area of 345 square miles. The principal lakes in the watershed immediately above Rainy Lake are Namakan, Kabetogama, Sand Point, Crane, and Little Vermilion.

a, LAKE OF THE WOODS SURVEY.

b, LONE TREE POINT.

In general, the Upper Rainy watershed and the watershed of the Lake of the Woods proper, possess very similar characteristics—the underlying Laurentian rock formation outcropping frequently, the soil cover being scant, lakes and ponds numerous, and the timber growth, on the whole, rather sparse. The Lower Rainy watershed is more heavily wooded and generally rather flat and swampy. Of the entire land area, about 8,500 square miles, or about 37 per cent, consists of arable or semiarable land, most of it, however, requiring drainage. A very small proportion of the total area, mainly narrow strips along the lakes and rivers, is under cultivation.[1]

[1] For further particulars as to physical characteristics of the region, see Supplement; also Report of Consulting Engineers.

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III.—FACTS AND CIRCUMSTANCES LEADING UP TO THE REFERENCE.

Early changes in outlets.

The outlets of the Lake of the Woods are in Canada near Kenora and Keewatin, Ontario, at the extreme northern end of the lake. Under natural conditions there were two main outlets. The larger of these, known as the Western Outlet, is that in which the present Norman Dam is located. The other, in which the Kenora municipal power plant is constructed, is termed the Eastern Outlet.

From the best information obtainable, the outlets of the Lake of the Woods remained in their natural condition until 1879. In that year a headrace for power purposes was built at the extreme western end of Portage Bay, Keewatin, in a depression which previously had served as an overflow channel for the lake when at high stages. About 1885 the power intake was further deepened. The power developed was used for the operation of a saw and planing mill down to 1906 when the plant was closed; since that date the channel has not been used for power purposes.

The extreme northerly portion of the Lake of the Woods at Portage Bay is separated from that part of the Winnipeg River known as Darlington Bay by a natural rock ridge along which now runs the Canadian Pacific Railway. In 1881 a small cut for power development was made through this ridge at the location of the present mill of the Lake of the Woods Milling Company, known as Mill C. About 1906 the site was purchased by the Lake of the Woods Milling Company. Nine years previously the same company had excavated a canal several hundred feet west of the one above mentioned for the development of power. This power is now used by Mill A.

The first attempt to exercise a measure of control over the level of the Lake of the Woods was made 30 years ago. It appears from the evidence submitted at public hearings and from our investigation, that because of the low stages of water in the lake for some time prior to 1887, the interest of navigation, then considerable on the Canadian side, was seriously affected. For the purpose of improving this condition, and mainly for the benefit of navigation, the Dominion Government authorized the construction of a dam, known as the

NORMAN DAM.

Rollerway Dam, in the western outlet of the lake.[1] To aid in the accomplishment of this purpose the Government appropriated the sum of $7,000.[2]

From the evidence it also appears, and this is not disputed, that the construction of the Rollerway Dam had the effect of raising the natural level of the lake an average of 1.5 feet during the years 1893 to 1898 for which continuous records are available.[3]

Some of the evidence obtained, including two records of water levels given in table 6, page 24, Report of the Consulting Engineers, indicates that when first built this dam raised the level of the lake substantially 3 feet.

In 1893–1895, under authority of the Government of Ontario, another dam known as the Norman Dam was built by the Keewatin Power Company (Ltd.), in the Winnipeg River about a mile below the Rollerway Dam. The Norman Dam[4] consists of a rock fill and 20 masonry piers with sluices, controlled by means of stop logs. It was originally intended for power development, but the project was never completed. The stop logs were not placed until 1898, when, under a contract with the Keewatin Power Company, the Provincial Government paid the company $4,000 to be used in providing the necessary stop logs, and at the same time secured the right, subject to cancellation by either party upon one month's notice, to thereafter control the dam for the benefit of navigation.[5]

Since November 19, 1898, the dam has been so controlled by the Provincial Government under this contract.[6]

The contract also provided that in case of cancellation at the request of the company, "It shall nevertheless be the duty of the company to maintain the water at ordinary summer level for such purposes as aforesaid at all proper time and times thereafter." In the contract liability for damage resulting from raising the lake above ordinary summer level is covered by the following statement:

> It is also agreed that the commissioner is not to be responsible for damages occasioned by reason of the water being raised higher than ordinary summer level unless the same is raised for the purpose of, and at the instance of, the Government or by their servants or agents.

Although the Rollerway Dam, constructed in 1887–88, was removed in 1899, the effect of the construction and maintenance of the Norman Dam upon the level of the Lake of the Woods was similar to that of the Rollerway Dam, but more marked, in that it maintained

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[1] Report of Consulting Engineers (plates), plates 19, 26, 29, (text) Plate C.
[2] Idem (text), pp. 8, 9.
[3] Idem (plates), plates 114–17, (tables) Table 74.
[4] Idem (text), Plates A and B, (plates) Plate 27.
[5] Final Public Hearings, Winnipeg, February, 1916, pp. 495, 496.
[6] Report of Consulting Engineers (tables), Table 6, p. 32.

the mean lake level about 3.5 feet above what it would have been under natural conditions.[1] The increase over the levels which would have prevailed with the outlets in a state of nature has varied from 0.9 foot in 1899 to 6.3 feet in 1913.

Warroad Harbor improvement.

In 1902, on the basis of surveys of Warroad River, authorized by the Congress of the United States and made by engineers of the United States War Department in 1899 to 1900,[2] a project was adopted by Congress for the improvement of Warroad Harbor so as to provide a 7-foot channel. In the plans for this improvement, all depths were reduced to what the War Department later referred to as the "normal" level of the lake; that is, a stage of 7.2 feet on the Warroad gauge, corresponding to 1,060.8, sea-level datum.

This is the stage which prevailed on the lake at the beginning of the survey in December, 1899. In each navigation season between 1901 and 1904 the lake level fell somewhat below the stage of 1,060.8 and in 1904 it reached that stage for only a few days.[3]

When the project was extended by Congress early in 1905, the United States engineers in charge, knowing of the existence of a dam in one of the outlets of the lake by means of which the level could be to some extent controlled, believed that through cooperation with the proper Canadian authorities the dam could be so operated as to secure a level more satisfactory to the maintenance of the projected depths in Warroad Harbor than the stage which had prevailed since the adoption of the project.[4]

As a consequence in May, 1905, the Government of the United States suggested to the Government of the Dominion of Canada that the Norman Dam be so operated as to prevent the level of the Lake of the Woods from falling below the datum of 7.2 on the Warroad gauge, i. e., 1,060.8, sea-level datum.[5]

After investigation and consideration of the matter, the Canadian Government concluded that the request of the United States Government could not be granted because the maintenance of the minimum stage of 7.2 would result in injury to important industries at Keewatin and Kenora in time of high water, and also because it would be impossible to maintain a minimum stage of 7.2 during low water without constructing a dam in the eastern outlet of the lake.[6]

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[1] Evidence of either the accidental or the intentional lowering of the Rollerway Dam between 1890 and 1892 appears on plate 111, Report of the Consulting Engineers. Two water levels, one on July 15, 1889, and one on July 15, 1890, given on this drawing, indicate a lowering of the effective heights of this dam by about 1.25 feet. The remaining portion of the dam was removed in 1899 after the completion of the Norman Dam.

[2] Final Public Hearings, Winnipeg, February, 1916, pp. 467–471.

[3] Report of Consulting Engineers (plates); plate 120.

[4] Final Public Hearings, Winnipeg, February, 1916, p. 517.

[5] Idem, p. 518.

[6] Idem, pp. 518–524.

This conclusion was never officially communicated to the Government of the United States. In 1906 the eastern outlet of the lake was completely closed by the construction of a power plant by the town of Kenora.[1]

First complaints against flooding.

In 1895, seven years after the completion of the Rollerway Dam, Colonel Naff, of the General Land Office, United States Department of the Interior, was sent to the Lake of the Woods to investigate complaints made by settlers on the south shore of the lake in Minnesota that their lands had been submerged by high levels caused by the construction of the Rollerway Dam. Colonel Naff reported that it was claimed by the settlers that the Rollerway Dam had raised the level of the lake about 3 feet higher "than its natural stage," and "that the month of May will be the best season of the year to make a critical examination of the condition and extent of the overflowage and the amount of damage done upon which to base a plea of complaint and for relief.[2]

Apparently no action was taken in the matter by the United States Government, nor was the matter ever brought officially to the attention of the Canadian Government.

The public-land surveys.

When the south shore lands in Minnesota were surveyed in 1893–1896, the surveyors of the United States Land Office ran the subdivisional lines out over the flooded lands on the south shore of this lake, in some cases more than a mile, and set the meander posts marking the border of the lake at the shore line forming the dividing line between open water and willow brush or marsh grass.[3]

These lands in the United States have been patented to homesteaders on the basis of the acreage shown on the Land Office maps, even though a portion of the platted area was and ever since has been under water. It is to be noted, however, that according to the testimony at the Warroad hearing in 1915, the majority of the settlers on the south shore of the Lake of the Woods came in in 1899 and 1900;[4] that is to say, after the completion of the Norman Dam.

United States Government endeavors to ascertain validity of complaint.

As the result of flooding of lands along the south shore of the lake in 1905,[5] and 1907,[6] protests were made by the settlers to the United States Government. The 1907 protest consisted of a series of affidavits which reached the United States State Department about the end of that year. On the 1st of February, 1908, Acting Secre-

[1] Report of Consulting Engineers (text), p. 154, Plates V to Z.

[2] Idem, Appendix I, p. 233.

[3] This is clearly shown by maps on file in the offices of this commission, prepared by Mr. George A. Ralph, former State drainage engineer of Minnesota, who made most of the land surveys along the south shore of the lake, and also by the Government field notes of these surveys filed in the State capitol at St. Paul, Minn.

[4] Further Public Hearings, Warroad, September, 1915, p. 110.

[5] Final Public Hearings, Winnipeg, February, 1916, pp. 524–525.

[6] Public Hearings, Warroad, September, 1912, p. 107.

tary of State Robert Bacon addressed the honorable, the Secretary of War, as follows:

Protests have been filed in this department in behalf of the settlers on the southern shore of the Lake of the Woods on the northern border of Minnesota against the elevation of the surface of that lake above its normal level as existing at the time they located there, which they allege has resulted from the damming of one or more of the outlets on the Canadian side of the lake, and in consequence of which they claim that their lands have been submerged.

It appears that under the plans for the improvement of Warroad Harbor on this lake, in accordance with the plans approved by Congress and carried out under the direction of the War Department, it is essential that the level of the lake be maintained at 7.2 feet on the gauge at Warroad Harbor, and in May, 1905, the Secretary of War wrote to the Secretary of State requesting that an arrangement be entered into with the British Government by which a dam across one of the outlets of the Lake of the Woods, which was under the control of the provincial government of Ontario, and by means of which the level of the lake could be to some extent regulated, should be so operated as to prevent the level of the lake from falling below the datum of 7.2 feet on the Warroad Harbor gauge. It does not appear, however, what relation this level bears to the normal level of the lake under natural conditions and in connection with the present protests I desire to obtain this information, and also any further information which the department may have, showing the changes which have taken place in the level of the lake in recent years with reference to that gauge, and the relation between the present level of the lake and the datum of 7.2 feet on that gauge.

It may be noted that none of the protests referred to above were brought to the attention of the Canadian Government by the Government of the United States.

The engineers of the United States War Department, who had charge of the navigation improvements on the Lake of the Woods, recognized the right of the Government to maintain the lake at ordinary high-water mark in the interest of navigation, but notwithstanding the report of Colonel Naff to the effect that it was claimed by the settlers that the Rollerway Dam constructed in the western outlet of the lake for the benefit of navigation had raised the level of the lake about 3 feet, they believed that the stage of water prevailing between 1899 and 1908 was not above ordinary high water under natural conditions. It does not appear, however, that the report of Colonel Naff had previously been brought to their attention. They believed, moreover, that in so far as the higher stages were concerned, the level was not subject to the operation of the dams at the outlet. For example, in April, 1906, Major Derby wrote to the Chief of Engineers:[1]

It is not impossible, though I do not think it probable, that the Keewatin Dam (which is the Norman Dam) was so manipulated during these four years (referring to 1899, 1903, 1904, and 1905) as to affect the high-water stage. On

[1] Final Public Hearings, Winnipeg, February, 1916, p. 473.

a, KENORA POWER HOUSE.

b, WINNIPEG CITY POWER PLANT.

the two occasions when the dam was inspected by agents of the United States Engineer Department, the slope in the mile of river between the dam and the lake was reported as 3 feet and 6 feet, respectively.

The view that only the low stages on the Lake of the Woods had been increased appears to have prevailed even in Canada. The Rollerway Dam was built in 1887 for the specific purpose of raising the *low-water* level. It was a long submerged dam which raised the low-water level about 3 feet and the extreme high-water level less than 1 foot.

Similarly the Norman Dam, built 1893–1895, was to be operated by the Keewatin Power Company at all times so as "to maintain the water of the Lake of the Woods at ordinary summer level" * * * "for the purpose of improving the navigation of the said lake," and, furthermore, it was agreed that "the commissioner (representing the government of Ontario) is not to be responsible for damages occasioned by reason of the water being raised higher than ordinary summer level unless the same is raised for the purposes of, and at the instance of, the Government, or by their servants or agents." That the level of the Lake of the Woods was being maintained at "the old normal level before there were any dams in here at all"[1] was the belief expressed by several witnesses who appeared before the commission at Kenora in 1912.

On February 15, 1908, Major Shunk, replying to an inquiry from the Chief of Engineers requesting information desired by Assistant Secretary Bacon in his letter of February 1, 1908, as to the relation between 7.2 on the Warroad gauge and "the normal level of the lake under natural conditions * * * also any further information which the department may have showing the changes which have taken place in recent years with reference to that gauge," stated that the fluctuations from 5.10 to 8.90 on the Warroad gauge during the year 1907 "were due to natural causes and not to the operation of dams."[2]

This statement of Major Shunk was apparently based upon the report of his assistant engineer, Mr. R. Davenport, who on February 13, 1908, after comparing the rainfall for the eight years prior to 1895 with that for the 12 years thereafter, stated that:

> Under the conditions above mentioned, it is considered that the variations in the said lake surface level have resulted from natural conditions and not from the operation of the dams at the outlet.[3]

Mr. Davenport added:

> From previous information, it may be stated that the period during which the natural surface level of the Lake of the Woods was established in the minds of the early settlers was prior to the year 1896, during the low rainfall periods above mentioned.

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[1] Public Hearings, Kenora, September, 1912, p. 154.
[2] Final Public Hearings, Winnipeg, February, 1916, p. 474.
[3] Report of Consulting Engineers (text), Appendix VI.

The Chief of Engineers inquired further, on February 29, 1908, relative to the "natural level of the lake before the construction of the Rat Portage Dam."

Replying to this inquiry Major Shunk reported on March 3, 1908:[1]

There are no records in this office which will give any information as to the level of the lake before construction of the Rat Portage Dam. This dam was built in 1898.[2] The gauge at Warroad was set in 1899, and there are no records before that time. When the gauge was set, the mean level of the lake during the open season was assumed to be 7.2 feet as stated in my letter of February 15, 1908, This information was based upon the best available local information, and subsequent observations have shown that it was very nearly correct and would indicate that the level of the lake has not been greatly changed.

In his letter of March 18, 1911, Major Shunk stated:[3]

It is not a fact that 7.2 level was derived from seasons when there was an exceptionally high stage of water. It was first assumed in the absence of records from the best information available, derived from marks and residents about the lake.

Fluctuation in lake levels and proposed diversion led to request for submission of reference.

According to the evidence, the submission of the question of the regulation of the levels of the Lake of the Woods and the advantageous use of its waters, and of the waters flowing into and from that lake, is an outgrowth of changes and fluctuations in its level which culminated in the low water conditions of 1910 and 1911, and of attempts, on the part of certain interests in the United States to divert some of the water from the Lake of the Woods watershed into Lake Superior. In his report of June 9, 1911, to the Chief of Engineers, United States War Department, Major Shunk stated:[4]

It would be perfectly possible by proper works at the outlet to maintain a good depth of water in the Lake of the Woods at all times. In this particular, however, the interests of navigation and those of power development are directly opposed. * * * It is certainly to be recommended that this matter be brought to the attention of the International Joint Commission.

After an examination of the Norman Dam, Major Shunk reported on June 30, 1911, that this dam on account of the great leakage through the rock fill.[5]

Is undoubtedly one cause, and a very considerable one, of the slow recovery of normal level in that lake. * * * It is my opinion that the rubble mound referred to ought to be made water-tight; and as the United States has a considerable interest in the regulation of lake levels, I recommend that the general question of regulation be referred to the International Commission.

As the outflow of the lake was not all being utilized there appeared to be no reason why the "rubble mound" of the Norman Dam should

[1] Final Public Hearings, Winnipeg, February, 1916, p. 475.
[2] Built in 1893–1895; put into operation in 1898.
[3] Final Public Hearings, Winnipeg, February, 1916, p. 476.
[4] Idem, p. 478.
[5] Idem, pp. 478–479.

not "be made water-tight" so as to prevent the lake from falling to such a low stage as it did in 1911. The engineers of the War Department in charge of the St. Paul district, between 1904 and 1911, believed that the level which they desired, viz: 7.2 on the Warroad gauge was about 1 foot below ordinary high water under natural conditions and that consequently no lands would be flooded if the lake were so maintained.[1]

Birch Lake diversion.

It also appears from certain correspondence which took place between the Governments of the United States and Canada that a proposed diversion of the waters of Birch Lake in northern Minnesota from the Lake of the Woods watershed to Lake Superior was likewise one of the matters which led up to the reference.

On December 22, 1910, a report of the committee of the Privy Council of Canada was approved by the Governor General. The report sets forth the fact that the city of Winnipeg and other Canadian interests had protested against the proposed diversion (the Birch Lake diversion); that the International Waterways Commission[2] had reported against the granting of a permit for the diversion without the concurrence of the Canadian Government; that Article II of the treaty is designed to safeguard interests on one side of the boundary injuriously affected by such a diversion on the other side of the boundary; that paragraph 3 of the permit granted by the United States Secretary of War (for the Birch Lake diversion) is doubtless intended to provide such special conditions as will protect private interests on both sides of the boundary line; that citizens of Minnesota are possibly protected by State legislation, but that "special conditions may have to be imposed on the company for the protection of property and other private interests on the Canadian side of the international border, so as to provide the citizens of Canada the same legal remedies as if the injury done them took place in the State of Minnesota"; that the Government desires information as to "what rights and remedies the citizens of Minnesota will have with regard to the proposed diversion, and what corresponding measures are intended to be taken with a view to the establishment of similar rights, and to provide similar remedies for citizens of Canada."

In regard to the apprehended injury to navigation the report requests:

> That the United States Government should be asked whether in cases where the diversion or obstruction of water in one country may be productive of injury to navigation interests in the other, permission for such diversion or obstruction should be granted until the International Joint Commission provided for in the

[1] Final Public Hearings, Winnipeg, 1916, p. 473.
[2] Report of International Waterways Commission, Nov. 15, 1906, pp. 118–131.

Boundary Waters Treaty has considered and reported upon the effect of such diversions or obstructions upon such interests, with regard to the compensatory works necessary to be constructed in each case.

On December 29, 1910, His Excellency the Governor General forwarded a copy of the report mentioned above to the British embassy at Washington with the request that the matter be brought to the attention of the United States Government with the object of obtaining an expression of their views on the subject. On August 22, 1911, the Acting Secretary of State at Washington replied to the British ambassador stating that:

The provisions of Article II are regarded by this Government as self-operative as laws and do not require any supplemental legislation to give them effect on this side of the boundary, so that by virtue of this article of the treaty the Canadian interests concerned are already entitled to all the legal rights and remedies which would be extended to them in the local courts if their cause of action arose within the jurisdiction of those courts.

I regret that this Government can not undertake to answer your inquiry as to what are the rights and remedies of the citizens of Minnesota in respect to such a case as the one under consideration for that is a question that depends to a great extent upon State law rather than Federal law, and falls outside of the jurisdiction of this department, except in so far as the treaty requires that Canadian interests shall receive the same treatment as similar interests in the State of Minnesota, and on this point the provisions of the treaty are regarded as sufficient in themselves to insure such treatment.

This Government has also given careful consideration, as requested by you on behalf of the Canadian Government, to the question of whether in cases where the diversion or obstruction of water in one country may be productive of injury to navigation interests in the other, permission for such diversions or obstructions should be granted until the International Joint Commission provided for under the treaty has considered and reported upon the effect of such diversions or obstructions upon such interests and with regard to the compensatory works necessary to be constructed in each case.

It appears from an examination of the terms of the treaty that no jurisdiction is conferred upon the International Joint Commission with reference to waters flowing across the boundary, or which are tributary to boundary waters, in distinction from boundary waters themselves as defined in the treaty, and that, therefore, the commission has no authority to refuse permission to divert or obstruct waters of the description referred to in this inquiry. That the Canadian Government concurs in this view is evident from the fact that instead of proposing that the desired action be taken under the treaty the proposal comes in the form of a request for the cooperation of this Government. In the absence of an express treaty provision conferring upon the commission jurisdiction to deal authoritatively with a case involving a diversion of tributary waters it does not seem desirable to this Government that such a question should be referred to the commission because the rights of the interested parties in such cases are conclusively established under the provisions of Article II of the treaty and an attempt by the commission to interfere in such rights would necessarily be ineffective. Under Article IX of the treaty, however, jurisdiction is conferred upon the commission to examine and report at the request of either party upon all questions not otherwise dealt with in the treaty which involve the rights, obligations, or interests

FLOUR MILLS AT KENORA.

of either party in relation to the other or to the inhabitants of the other along their common frontier, and it would be agreeable to this Government to take up with the Canadian Government the question of requesting the commission to examine into and report upon a general plan for the improvement for navigation and power purposes of all the boundary waters to which the waters referred to in your note are tributary.

Long Sault Dam.

It may also be noted that in 1900 the Government of Canada had under consideration a project for improving the navigation of Rainy River by means of a dam and lock at the Long Sault Rapids. In view of the fact that the proposed work would extend from shore to shore of an international stream, representations were made in 1908 by the Government of Canada, through the British Embassy, to the United States Government, with the object of obtaining the consent of that Government to the construction of the dam. The Attorney General of the United States, however, was of the opinion that in the absence of a treaty or congressional legislation authorizing the same, such consent could not be given. In 1911 the matter was taken up by the Western Canal Company as a combined power and navigation project, but apparently was eventually abandoned.

Inasmuch as a complete report "on the facts and circumstances of the questions referred" and full consideration of the numerous questions presented and discussed by counsel for the Governments and interests concerned will necessarily cover a wide range, the commission will first report its conclusions and recommendations in answer to the specific questions of the reference, following the same with a statement of facts and circumstances in support of such conclusions and recommendations.

IV.—CONCLUSIONS AND RECOMMENDATIONS: QUESTION ONE.

In order to secure the most advantageous use of the waters of the Lake of the Woods and of the waters flowing into and from that lake on each side of the boundary for domestic and sanitary purposes, for navigation and transportation purposes, and for fishing purposes, and for power and irrigation purposes, and also in order to secure the most advantageous use of the shores and harbors of the lake and of the waters flowing into and from the lake, is it practicable and desirable to maintain the surface of the lake during the different seasons of the year at a certain stated level; and, if so, at what level?

Interpretation.

A strict interpretation of the first part of this question would necessitate a reply in the negative. In view of the great variations in precipitation occurring from year to year, the maintenance of an absolutely uniform level of the Lake of the Woods, over long periods of time, is not practicable, nor is it desirable, because it would not admit of the most advantageous use of the waters flowing into and from that lake.

Having in mind, however, the origin of the questions of the reference, it is clear that a "certain stated level" refers nevertheless to a relatively uniform level.

Regulation desirable.

A careful study of the physical data submitted in the report of the consulting engineers, and a consideration of all the interests involved, lead to the conclusion that it is practicable and desirable to maintain the lake at a relatively uniform level throughout all ordinary seasons, but that in order to secure the most advantageous use of the waters flowing from the lake, it is necessary to permit a draft on the water stored in the lake, in excess of 2 or 3 feet, during periods of exceptional drought occurring about once in 20 years, for the purpose of maintaining a satisfactory outflow; and also to permit the storage of some of the flood water above the ordinary maximum level during occasional years of excessive flood inflow.

The recommended level.

Because of the diverse requirements of the various interests, it is an impossibility to recommend a level or regimen of levels which would be of equal desirability to all these interests. After careful consideration of all the factors entering into this problem, the commission is of the opinion that, subject to proper compensation and protection being provided, for property and interests injuriously affected, the most advantageous use of the waters of

the Lake of the Woods and of the waters flowing into and from that lake and of the shores and harbors of the lake, can be secured by maintaining the level of the lake at an ordinary maximum stage of 1,061.25, sea-level datum. Whenever the level of the lake rises to 1,061.0, sea-level datum, water shall be wasted or conserved as directed by the commission under the system of international supervision and control hereinafter recommended, and between 1,056 and 1,061 water may be drawn from the lake by the appropriate authority in Canada for the benefit of Canadian interests, provided, however, that the level of the lake shall not, even toward the end of a series of dry years, be drawn below 1,056 sea level datum, without the approval of this commission, and then only on such terms and conditions as it may impose.

The commission is further of the opinion that if the additional storage hereinafter recommended for the Upper Rainy watershed is provided, the ordinary maximum level can be slightly increased without injury to any interests on the lake and with material benefit to the water power interests both at and below the outlets. This can be done within the limits of flowage rights to contour 1,064.

The term "level of the lake" wherever used in this report shall be construed to mean the level of the open lake unaffected by wind or currents.

V.—CONCLUSIONS AND RECOMMENDATIONS: QUESTION TWO.

If a certain stated level is recommended in answer to question 1, and if such level is higher than the normal or natural level of the lake, to what extent, if at all, would the lake, when maintained at such level, overflow the lowlands upon its southern border, or elsewhere on its border, and what is the value of the lands which would be submerged?

Comparison of recommended level with present controlled and computed natural level.

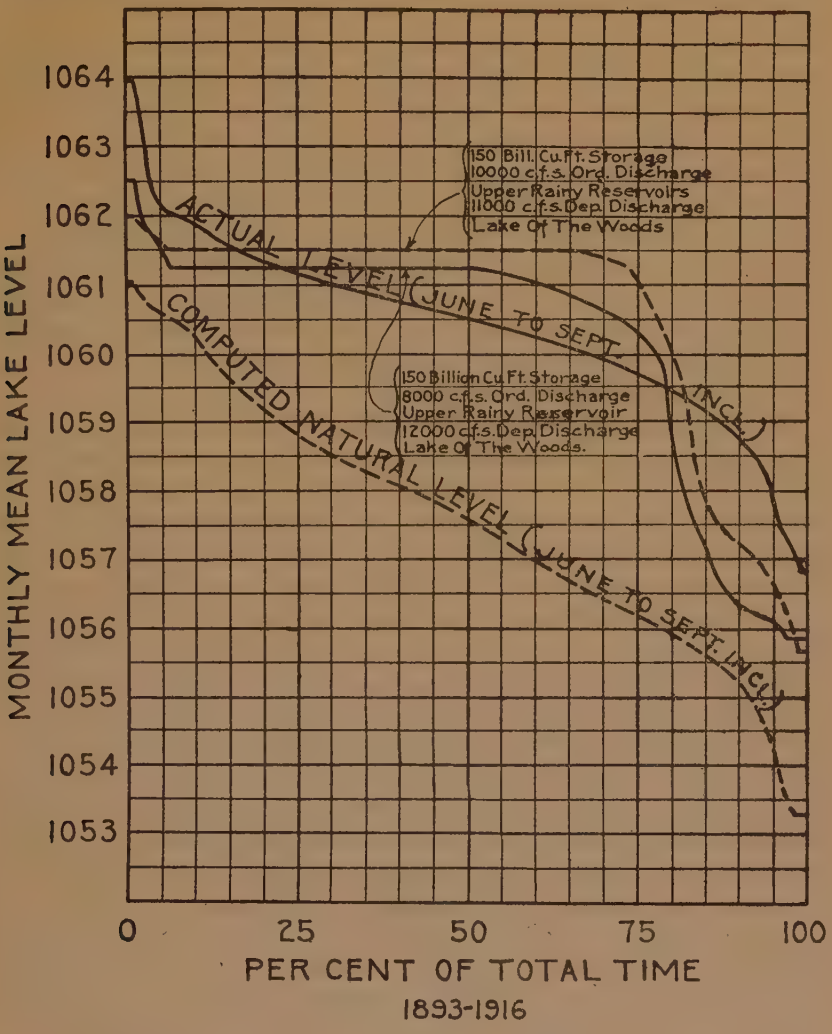
The average controlled level of the Lake of the Woods between 1892 and 1916 was 1,059.82. The average level which would have prevailed during the same period of years, if the outlets had remained as in a state of nature, is 1,056.77 or practically 3 feet lower. Ordinary high water, from the viewpoint of the rights of the riparian owners, is dependent upon the level which prevails during the planting, growing, and harvesting season. For the purpose of this report, we have adopted the mean of all levels above the average summer level prevailing between June 1 and September 30 as mean or ordinary high water. On the basis of comparison of ordinary high water the recommended level of 1,061.25 is 2.23 feet higher than the computed natural level of the lake, and 0.03 feet lower than the actual level which has prevailed during the past 24 years of partial control.

An examination of figure 1, showing the frequency of various summer lake levels, indicates that the recommended ordinary maximum level would be much more uniform than either the natural level or the level that obtained under the control exercised in the past, and that under the proposed regulation exceptionally high water would have occurred less frequently than in the past 24 years and would have never exceeded the extreme high-water marks shown on the rocky shores of the lake, at an average elevation of 1,062.5, even in a season like 1916, when the stage actually rose to 1,064.

If the regimen of lake levels which would prevail under the recommended system of regulation were exactly similar to the regimen of levels prevailing in a state of nature and under the past control, then a comparison of the ordinary high-water levels under these different conditions would give a correct measure of the relative amounts of land submerged and injuriously affected under these conditions. Under the recommended system of regulation, however, the ordinary high-water level will prevail for a much greater proportion of the time, and hence land lying above ordinary high-

WINNIPEG RIVER.

water mark will be more injuriously affected than under the fluctuating regimen of levels prevailing both in a state of nature and under present conditions of control. For example, with the proposed



FREQUENCY CURVE OF
ACTUAL, NATURAL AND REGULATED LEVELS
LAKE OF THE WOODS (JUNE TO SEPT. INCL.)

FIG. 1

regulation applied under the hydrological conditions which prevailed during the past 24 years, the lake level would have been below 1,061.0 only 40 per cent of the time, whereas it actually was below this level 70 per cent of the time.

Riparian lands affected.

Although the increased discharge capacity of the western outlet of the Lake of the Woods, recommended in answer to question three, will greatly increase the physical power of control over the flood waters of the lake, and will absolutely prevent the lake from rising to any such level as it attained during the flood of 1916, nevertheless, the contingency of still greater flood inflows into the lake than during the past 25 years must be provided for as a reasonable "factor of safety." Moreover, during high northeasterly winds, the southerly portion of the lake occasionally rises a foot above the mean lake level for portions of a day and sometimes longer. Allowance must also be made for seepage effects and coldness and sourness of soil resulting from proximity of the water table. In view of these considerations, it is believed that all land lying below the 1,064 contour will be either submerged or injuriously affected under the proposed regulation and maintenance of the recommended level.

Normal or natural level.

The expression "normal or natural level" has been given at least two interpretations by the parties to the reference and other interests. On the one side, it was contended that the expression means the lake stage which had prevailed so long as to have become the normal level at the time the reference was submitted. On the other it was argued that the expression means the level which prevailed on the lake in a state of nature before the outlets were obstructed. The commission has adopted the latter interpretation. It has concluded that the recommended level of 1,061.25 is over 2 feet higher than the "normal or natural level" of the lake, and that all lands lying between the 1,064 contour and the 1,059 contour, which the commission believes fairly represents ordinary high water under natural conditions, will be either submerged or injuriously affected at the recommended level. However, since the meander line established by the United States land surveyors was believed to be ordinary high water at the time the surveys were made, and the riparian owners' titles extend down to this line, the commission further recommends that all private lands between the 1,059 contour and the meander line be also considered as lands which will be submerged at the recommended level.

Land values.

The total area of affected lands between the old meandered shore line and the 1,064 contour is 23,968 acres in the United States and 40,792 acres in Canada. Of the United States land 13,504 acres and of the Canadian land 4,671 acres were in private ownership or had been filed on, on December 31, 1915.[1] The commission is of the opinion that unoccupied lands in territory far removed from settlement, especially in the watershed under consideration, have at the present time no particular value be-

[1] The total acreages in Canada and the United States on Dec. 31, 1916, were substantially the same as those given for Dec. 31, 1915.

a, FLOODED FARM, SOUTH SHORE.

b, LUMBER SLIDE, UPPER WATERSHED.

yond that of the timber that may be found thereon. It is, however, aware that the minimum prices at which public lands have been offered for sale are as follows: Minnesota State lands $5 per acre, Canada Federal lands $3 per acre, and United States Federal lands $1.25 per acre. Counsel for Ontario has stated to the commission that that province is willing to accept a nominal value for its land, provided the other Governments concerned are willing to do likewise. Assuming, therefore, a nominal value of $1 per acre for all public lands affected in both countries, the commission estimates the aggregate value of the United States land injuriously affected by the proposed regulation of the Lake of the Woods to be $163,957 and of the Canadian land similarly affected $80,877. These estimates include the value of all improvements on privately owned lands, such as buildings, fences, roads, and ditches that would be affected by the proposed regulation.[1]

Other property rights affected.

In addition to compensation for flowage over the improved agricultural and wild lands, the commission finds that provision will have to be made for the removal of buildings and loss by erosion of lands along the high banks on the lake shore where no actual flowage results. It also appears that some outlying lots in the municipality of Warroad will be injuriously affected at the recommended level. It will also be necessary to protect the banks of Warroad River from erosion and to relocate, raise, and rip-rap the railway embankment east of the town so as to make it serve as a protection against surface flooding of the higher lands in and around Warroad, particularly during high wind. There will be some additional expense to Warroad on account of increased cost of operating and maintaining its sewerage system. In view of the very slight fall in the Rainy River as it approaches Lake of the Woods, some minor protection will be required to public and private interests along the water front in the vicinity of Baudette, Minnesota, and Rainy River, Ontario, on opposite sides of Rainy River, and about 12 miles up-stream from Lake of the Woods. The commission estimates that the total amount required as compensation in all these cases would not exceed $115,000.

Since the recommended ordinary maximum level is substantially equal to mean high water of past years and the occasional flood stages will be materially lower, the commission does not consider the proposed regulation disadvantageous to the campers and owners of islands and summer homes, boathouses, and docks around the lake. All improvements of the character mentioned have been made in conformity with the prevailing stage. It is believed the proposed regulation is in no way detrimental to existing sand beaches, although it is recognized that a lower level would expose a greater area of these beaches.

[1] For detailed information as to land values, see pp. 60–61; 163–166.

VI.—CONCLUSIONS AND RECOMMENDATIONS: QUESTION THREE.

In what way or manner, including the construction and operation of dams or other works at the outlets and inlets of the lake or in the waters which are directly or indirectly tributary to the lake or otherwise, is it possible and advisable to regulate the volume, use, and outflow of the waters of the lake so as to maintain the level recommended in answer to question 1, and by what means or arrangement can the proper construction and operation of regulating works or a system or method of regulation be best secured and maintained in order to insure the adequate protection and development of all the interests involved on both sides of the boundary, with the least possible damage to all rights and interests, both public and private, which may be affected by maintaining the proposed level?

How regulation may be effected.

In determining how the recommended level can be best maintained and the most advantageous use of the waters of the Lake of the Woods and of the waters flowing into and from that lake be best secured, the commission has, in accordance with the suggestion of the reference, considered the possible utilization of existing dams and regulating works both at the outlets of the Lake of the Woods and in the waters directly or indirectly tributary thereto. It has also considered to what extent further dams and regulating works, additional reservoir storage capacity, and changes in the discharge capacity of the several lake outlets are necessary or desirable to aid in accomplishing the end sought.

Enlarging the outlets.

Under existing physical conditions the discharge capacity of all the outlets of the Lake of the Woods at a level of 1,061, including water discharged through the power plants, is about 32,000 c. f. s. This discharge capacity, even if utilized to its full extent, and even in seasons of little more than ordinary precipitation on the watershed, will not admit of the discharge of water at a rate sufficiently high to prevent the level of the lake from rising to an elevation of 1,062, nor prevent it from rising as high as 1,064 during seasons of extraordinary precipitation, such as 1916, unless the lake is drawn down so low every spring as to preclude the possibility of advantageously utilizing the waters flowing from the lake.

The first requirement, therefore, for the maintenance of the recommended level is an increase in the outflow capacity of the Lake of the Woods to a total of about 47,000 c. f. s. at a stage of 1,061. This is about 13,000 c. f. s. greater than the natural discharge at the same stage. The cost of providing the increased outflow capacity mainly

through rock excavation in the western outlet would be approximately $175,000, depending largely upon the circumstances under which the work is done. Whether or not it will, at any time, be necessary to utilize this outflow capacity to the full extent will depend largely upon the foresight that is exercised before the reservoir storage capacity of the lake has been exhausted. When it is so utilized, however, some loss will result to the power interests at the outlets of the lake; and some riparian lands, boathouses, and other structures on the Winnipeg River between the lake and Minaki[1] will be damaged.

The estimated cost of compensating existing power interests at the outlets for the loss of head and permanently protecting them against flooding due to possible high tail-water stages resulting from the utilization of the full discharge capacity of the lake, is approximately $25,000, and the cost of flowage rights required on the Winnipeg River below the outlets is approximately $30,000.

The controlling works.

The regulation of the outflow from the Lake of the Woods involves the use of controlling works. The present Norman Dam in the western outlet is well adapted to such use. Although built for power purposes, it has sufficient wasteway capacity to discharge all the flood water that need ever be drawn from the lake through this outlet.[2]

Out of a total flood discharge of 47,000 c. f. s. at a stage of 1,061 it is proposed to pass 40,000 c. f. s. through this outlet, as against 29,000 c. f. s. under natural conditions. About 500 c. f. s. can be passed through the old Keewatin Lumber & Manufacturing Company's headworks, which require replacement in any event, and 6,500 c. f. s. through the Keewatin mills and the Kenora power plant after the latter has been remodeled as suggested later. These plants should be arranged so that the turbines can be run continuously at full gate in time of flood or blocked with the gates wide open.

Inasmuch as any power plant operating at the Norman Dam site might reasonably be expected to provide sufficient wasteway capacity in the dam to pass the natural flood flow of about 29,000 c. f. s. at a lake stage of 1,061, only an additional wasteway capacity of 11,000 c. f. s. is required to permit of the proposed regulation in the event that existing wasteways or flumes of equivalent capacity are in the future utilized for water-power purposes. Although the proposed channel enlargements will enhance the value of the Norman Dam as a water-power site by increasing the available head, the discharge of more water than would pass through the western outlet in a state of nature will decrease the head and to that extent depreciate the water-power

[1] Report of Consulting Engineers (plates), Plate 20.
[2] Idem, Plate 27.

value of the site. On the whole, the proposed regulation will substantially increase the value of this site over what it would be under natural conditions. It will be necessary, then, merely to provide the equivalent of the cost of wasteway capacity for 11,000 c. f. s., estimated at $60,000, and to acquire the right to control all the regulating works at the outlets in time of flood so as to permit the discharge of 47,000 c. f. s. through all outlets at a stage of 1,061 if this should ever be required. The additional wasteway capacity will not be actually needed unless a water-power plant is built at the Norman Dam.

Equalizing the outflow.

If the questions of the reference were limited to the maintenance of a reasonably uniform level on the Lake of the Woods, that end could be attained by acquisition of the necessary flowage rights and the provision of the necessary controlling works just indicated. The most advantageous use of the waters of the lake, however, can only be secured by equalizing the outflow so far as practicable. Under the circumstances surrounding power development on the Winnipeg River, there is little likelihood that these water-power interests will ever, in the future, develop more than the dependable outflow from the lake. These considerations make it highly desirable to provide the greatest dependable outflow that can be economically secured. The dependable outflow increases with the available reservoir storage, although at a decreasing rate. The most advantageous use of the waters flowing from the lake, then, can be secured by providing as much storage capacity as the resulting increase in dependable outflow will warrant.

Uses of present Upper Rainy storage.

Outside of the Lake of the Woods itself, the largest available storage reservoirs are Rainy Lake and the system of lakes controlled by the dams at Kettle Falls. There is at present a total of a little over 100 billion cubic feet of storage capacity available on these lakes. The most advantageous local use of this storage capacity in equalizing the outflow from Rainy Lake for the purpose of developing water power at the existing plants at International Falls and Fort Frances can be secured by discharging approximately 10,000 c. f. s. whenever stored water is available and there is a market for the product of the mills. This use of the available storage increases the dependable outflow from the Lake of the Woods by only a few per cent over what it would be if Rainy Lake were in its natural condition, and will not permit of as advantageous a use of the waters flowing from the Lake of the Woods as would the discharge of stored water from Rainy Lake at a rate of approximately 8,000 c. f. s. The records of the past 24 years indicate that the latter rate of discharge would assure that the Rainy Lake and Lake of the Woods reservoirs are full at the beginning of a dry period of years, and would result in

PITHERS POINT, FORT FRANCES.

an increase in the dependable outflow from the Lake of the Woods of about 1,000 c. f. s., or 10 per cent. Such regulation of the outflow from Rainy Lake, including control over the existing dams at the outlets of that lake and Lake Namakan, and including the release of stored water when required on the Lake of the Woods, while increasing the potential water power on the Winnipeg River by about 25,000 horsepower, would result in a loss of substantially 1,000 horsepower at International Falls and Fort Frances.

Increased storage on upper reservoirs desirable.

Aside from the change in the method of regulating the outflow from Rainy Lake, increased storage on that lake and on the lakes above Kettle Falls will also increase the dependable outflow from the Lake of the Woods. The commission is of the opinion that subject to proper compensation and protection being provided for property and interests injuriously affected, it is desirable to acquire 25 billion cubic feet of additional storage on Rainy Lake and 20 billion on the lakes controlled by the Kettle Falls Dams. It, however, recognizes the fact that the power companies at International Falls and Fort Frances, which provided the existing storage on these reservoirs, and have the right to the maximum advantage legally obtainable therefrom, may not be able to meet alone the cost of the suggested additional storage. It is also aware that the water powers in the Winnipeg River have not reached that point in their development where they require any advantage from such additional storage. At the same time, the commission believes that in view of the probably rapid increase in the cost of obtaining this additional storage in the future it would be desirable to arrange for the early acquisition of same upon some equitable basis by which the cost would be apportioned between all the interests concerned. It further believes that, as far as possible the two Governments, respectively, should reserve a flowage easement over all public riparian lands around the larger lakes on the watershed in both countries to an elevation of at least 5 feet above extreme natural high-water mark, or to such other elevation as after investigation they may agree upon.

It is difficult to determine the cost of this additional storage on Rainy Lake in view of the fact that the existing storage has not yet been settled for by the power companies at International Falls and Fort Frances, and much will depend upon the character and stability of improvements along the water front at Fort Frances, Ranier and International Falls.

Believing, however, from an examination of existing conditions that the cost of additional flowage rights around Rainy Lake to an elevation of 501, public works datum, and all additional protec-

tion to the towns of Fort Frances and International Falls, the village of Ranier, and to all industrial and commercial interests concerned, together with such protection of the Canadian Northern Railway as will be at least equal to that now enjoyed by this important interest, and all additional flowage rights around Namakan Lake and the other lakes above Kettle Falls to an elevation of 516, public works datum, and the protection of all interests around these lakes, will be materially less than the value of the water power which this additional storage will produce on the Rainy River and the Winnipeg River combined, when the demand for such power exists, the commission recommends that the ordinary maximum level of 499.5, public works datum, be adopted for Rainy Lake and 515, public works datum, for the Namakan Lake system, with an additional half foot for flood reserve on Rainy Lake, in order to obtain the further storage of 45 billion cubic feet and thereby secure a more advantageous use of the waters of the Lake of the Woods and the waters flowing into and from that lake.

Results secured with increased storage.

If this additional storage above indicated together with that now available were utilized primarily for equalizing the outflow from the Lake of the Woods and maintaining the recommended level, it would increase the available power at International Falls and Fort Frances above that now available by about 700 horsepower, making a total of about 30,000 horsepower on the Rainy River when the potential power of about 9,000 horsepower at the Long Sault Rapids is added, and it would increase the potential water power on the Winnipeg River by nearly 50,000 horsepower, or about 20 per cent more than that which would be available on this stream with the natural outflow from Rainy Lake and a range of about 6 feet in the levels of the Lake of the Woods. Assuming the entire 150 billion cubic feet of storage capacity on the Upper Rainy watershed utilized primarily for the purpose of increasing the available water power on the Rainy River, then there will be an increase of about 2,500 horsepower over that now available, making an aggregate of about 32,000 horsepower on the Rainy River when the potential power at Long Sault Rapids is included, and an increase in the total potential water power on the Winnipeg River of not less than 17,000 horsepower over what would be available with the natural outflow from Rainy Lake. Further increases in storage capacity will result in additional increases in dependable outflow from the Lake of the Woods and Rainy Lake, and while there will be decreasing returns from further investments in storage the limit of economical development possibly will not have been reached until more than 200 billion cubic feet of total storage capacity will ultimately have been provided on the upper watershed.

International supervision and control.

The commission recommends that it be authorized to exercise supervision and control over the operation of all dams and regulating works extending across the international boundary; the dam and regulating works across the Canadian channel at Kettle Falls; and the dams and regulating works at the outlets of the Lake of the Woods when its level rises above 1,061 or falls below 1,056, sea level datum. Between these levels supervision and control shall be exercised by the appropriate authority in Canada for the benefit of Canadian interests.

In the case of regulating works at the outlets of Rainy and Namakan Lakes the proposed international supervision and control shall be exercised with a view of protecting all rights and promoting the development of all interests, both public and private, on Rainy River and on the lakes controlled by such works, and also with a view of providing sufficient storage capacity in the lakes and discharging water therefrom at a rate which will prevent those lakes from exceeding the level of 497 for Rainy Lake and 508.5 for Namakan Lake. After the additional storage of 45 billion cubic feet herein recommended has been provided, the recommended extreme maximum level for Rainy Lake is 500 and for Namakan Lake is 515, public works datum; provided, however, that in securing storage capacity and in determining the rate of discharging water from the said lakes due consideration shall at all times be given to the level prevailing on the Lake of the Woods.

Until the outlets have been enlarged as recommended herein, the commission believes the levels of the lake should ordinarily be held at an elevation of 1,060.5, and that it should have authority to advise the Government of Canada, within whose territory the outlets are situated, as to increasing the discharge from, or conserving the waters of the Lake of the Woods, whenever it believes such changes in the existing regulation are necessary in order to safeguard international interests.

Furthermore, the commission is of the opinion, for the purpose of regulating the waters of Rainy Lake and the lakes controlled by Kettle Falls Dams, that it should at once be vested with authority to exercise control over all structures and regulating works extending across the international boundary and the Canadian channel at Kettle Falls.

The recommended international supervision and control shall be administered in such manner as this commission may from time to time deem necessary to protect and promote the development of all interests involved in both countries. The commission shall be empowered to appoint and to fix the salaries of two engineers, one from each country, who shall act as its representatives, under such rules

and regulations as it may prescribe, for the exercise of said supervision and control.

All reasonable and necessary expenses incident to the administration of the recommended supervision and control, including the salaries and expenses of such engineers, should be paid in equal moieties by the two Governments.

It is further recommended that, as a matter of sound international policy, neither Government should permit the permanent or temporary diversion out of the watershed of any waters within its jurisdiction which are tributary to the boundary waters under consideration, without first referring the matter to the commission for such recommendation as it may deem appropriate.

VII.—SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS.

Question I. The commission answers that it is practicable and desirable to maintain the surface of the Lake of the Woods at a relatively uniform level throughout all ordinary seasons. In order to secure the most advantageous use of the waters of the lake, and of the waters flowing thereinto and therefrom, and of the shores and harbors of the lake, for the purposes stated in this question, the commission recommends that the waters of the lake be maintained at an ordinary maximum stage of 1,061.25 sea level datum, with a range from 1,056 to 1,062.50 representing, respectively, the extreme low level and the extreme high level. These extremes, however, in the opinion of the commission, will be reached only in years of excessive drought and of excessive precipitation. The commission also contemplates that in extreme low water years the water of the lake may be drawn below 1,056, but only with its approval and upon such terms at it may impose. The commission, as stated in this report, also considers that with proper storage and after experience has been gained in regulation, the ordinary maximum level of 1,061.25 may be slightly increased.

Question II. The commission answers that the ordinary maximum level of 1,061.25, which it recommends, is 2.23 feet higher than the computed normal or natural level of the lake. Considering not only the low lands actually overflowed on the southern border of the Lake of the Woods or elsewhere on its border, but also the lands injuriously affected above the recommended ordinary maximum level through occasional flooding, wind effects, and seepage, the commission has concluded that flowage should be obtained up to contour 1,064, sea level datum. The commission therefore finds that the areas, with values as at December 31, 1915, for which flowage rights should be obtained, are as follows:

United States, 23,968 acres, value $163,957, or say	$164,000
Canada, 40,792 acres, value $80,877, or say	81,000
	245,000

The commission estimates that the cost should not exceed $115,000 for the following:

(1) The removal of buildings and compensation for loss of high land by erosion along the south shore of the lake in Minnesota.

(2) The necessary protection of the town of Warroad, including town lots submerged or injuriously affected.

(3) The necessary protection along water front in vicinity of Baudette, Minnesota, and Rainy River, Ontario.

About $5,000 of this estimate is for protection on the Canadian side of the boundary at and near Rainy River; the balance, $110,000, is for lands and protective works in Minnesota.

Question III. The commission answers that it is both possible and advisable to regulate the volume, use, and outflow of the waters of the Lake of the Woods, as well as to insure the adequate protection and development of all the interests involved on both sides of the boundary, in the following manner:

(1) By increasing the outflow capacity of the Lake of the Woods to 47,000 c. f. s. at a stage of 1,061, sea level datum, costing about $175,000; and by compensating interests at the outlets and on the Winnipeg River, involving about $25,000 and $30,000, respectively. The Norman Dam in the Winnipeg River should be used for regulating purposes, and the cost of securing such use will have to be included. Should it be used for power as well as regulating purposes, then the necessary additional waste-way capacity will cost about $60,000.

(2) By taking advantage of the existing reservoir capacity of something over 100 billion cubic feet on Rainy Lake and the lakes immediately above Kettle Falls.

(3) By enlarging these reservoirs as soon as the demands for power warrant, so as to be able to store an additional 45 billion cubic feet—the cost of which is difficult to estimate at the present time.

(4) By international control of all dams and regulating works extending across the international boundary, also the dam at Kettle Falls in the Canadian channel, and, when the level rises above 1,061 or falls below 1,056, sea level datum, the dams and regulating works at the outlets of the Lake of the Woods.

VIII.—DISCUSSION OF FACTS AND CIRCUMSTANCES IN SUPPORT OF RECOMMENDATIONS.

QUESTION ONE.

The first question of the official reference deals with the desirability and practicability of regulating the level of the Lake of the Woods for the purposes stated in the reference.

Numerous and diverse interests, both large and small, are in varying degrees dependent upon these waters. Navigation, agriculture, logging and lumbering, fishing, summer outing, water supply and sewage disposal, water-power development, and manufacturing may here be mentioned as the chief interests which must receive consideration.

Uniform level v. uniform outflow.

Regulation of the level of the Lake of the Woods may, broadly speaking, have in view two objects:

1. To secure as nearly uniform lake levels as possible through a period of years, irrespective of the effect of such regulation on the outflow.

2. To secure as nearly uniform outflow from the lake as possible, with only such incidental equalization of levels as is consistent with this object.

Both uniform level and uniform outflow could be obtained only if the inflow into the Lake of the Woods could be completely equalized. Since physical limitations are such that a large portion of this inflow must always remain uncontrolled, both uniform level and uniform outflow can not be secured.

Any method of regulation which aims to secure either uniform level or uniform outflow, or any combination of the two, will affect the various interests involved in different ways. No single method or combination of methods of regulation will be most advantageous to all of the several interests, consequently "the most advantageous use" of the waters, shores, and harbors of the lake and of the waters flowing into and from the lake must be considered to be that representing the maximum aggregate advantage to all interests involved.

Riparian lands.

Regulation affecting riparian lands.

The most desirable level for the agricultural interests around the Lake of the Woods is a low level. These interests are not directly concerned either in the outflow or in the fluctuation in lake level, so long as the highest level to which the lake is permitted to rise is a low one. If the outlets were enlarged

with a view to lowering the lake as much below its natural level as practicable, only about 5,000 acres of additional United States land would become available for use. Much of this land is covered with more than a foot of peat vegetation. The cost of so lowering the lake, considering only the required enlargement of the outlets and additional dredging in the harbors on the United States side, would be equivalent to more than $60 for every acre of land reclaimed.

Maintaining the lake at a low level is clearly uneconomical, even from the viewpoint of the agricultural interests; and when the other interests involved are considered, it becomes apparent that, looking to the uses that will procure the best results, riparian lands are more valuable for flowage purposes than for agricultural purposes. When compensation is allowed for the right of flowage, and eroding banks are protected, agricultural and other riparian interests around the lake are, within reasonable limits, about as well served by one level as by another.

Regulation affecting lands below outlets.

While the riparian owners on the lake are affected by the levels proposed, riparian owners on the Winnipeg River are affected by the proposed rates of discharging flood water. A fair basis from which to measure compensation to these interests would be ordinary high-water mark under natural conditions. The improvements on these riparian lands consist primarily of docks, boathouses, and cottages built during low-water years. Many of these structures are below natural high-water mark. However, if full compensation is paid for the necessary remodeling of structures and flowage over improved agricultural lands, the total cost would be about $30,000. The cost of these flowage rights would be independent of the level adopted for the lake.

Navigation and lumbering interests.

Draft of boats.

Navigation on the Lake of the Woods consists principally of the towing of logs and the transportation of freight and passengers by steam and gasoline boats. Most of the gasoline boats are of relatively light draft, requiring from 2½ to 4 feet of water. Most of the steamboats vary in draft from about 4 to 6 feet, a few of the larger boats being reported as drawing from 8 to 10 feet of water.[1]

North-shore summer resorts.

The effect of various levels on the navigation and the summer-resort interests, in the vicinity of Kenora, is in a large measure determined by the depths in the various navigation channels and harbors of the lake, by the available depths of water leading into the boathouses, and by the elevation of the boathouse floors and the tops of docks. Information relating to boathouses and docks is summarized in the frequency curves of plates 141

[1] See appendix to this report, p. 285 et seq.

HIGH WATER AT FORT FRANCES.

and 142, report of consulting engineers, and the detailed data are filed in the offices of the commission. It appears from these curves that the tops of all docks in the vicinity of Kenora and Keewatin are at or above an elevation of 1,061, sea-level datum, and that the boathouse floors are all above an elevation of 1,059.5, over 90 per cent of them being above 1,061. Only about 50 per cent of both docks and boathouse floors, however, are above elevation 1,062.

Lumbering operations.

The lumbering interests are affected by the levels of the Lake of the Woods mainly in so far as the stage of the lake has a bearing on the facility with which logs can be taken out of the various bays and inlets, and then towed across the lake and hoisted into the mills by means of jack ladders. In low water the towing channels become narrower and more difficult of navigation with log booms, through the protrudence of reefs above the water surface. The cost of handling logs in the log ponds of the mills is also increased.[1]

Harbors on lake.

Low stages, that is, stages below about 1,058, will also require additional dredging in harbors and navigation channels in various portions of the lake. At the hearing in January, 1914, in Washington, Colonel Charles L. Potter, United States Army, in charge of the district which includes the United States portion of the Lake of the Woods, testified that the cost of dredging the harbors of Zippel and Warroad was $9,600 per foot increase in depth.[2]

Testimony regarding desirable levels.

At the public hearings, 1916, Mr. W. J. Stewart, chief hydrographer, speaking for the Dominion Government, stated that an occasional low level of 1,056 could be accepted and that an ordinary level of 1,060.5 would be desirable for the navigation interests, but that 1,061.0 was not objectionable, except in so far as it might make it difficult to prevent the lake from exceeding 1,062.5 in seasons of extreme flood.[3]

This statement was based on an assumed outflow capacity of 40,000 c. f. s., and later through counsel for the Dominion Government Mr. Stewart recommended 1,061 as the "spilling point."[4]

The commission has recommended an outflow capacity of 47,000 c. f. s. to guard against the extreme high stage mentioned, consequently the recommended ordinary maximum level of 1,061.25 would meet the navigation requirements of the Dominion Government. Counsel for the Ontario Government requested that the minimum be set at 1,056.[5]

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[1] Further Public Hearings, Kenora, Ontario, September, 1915, pp. 409, 423, 424, 431, 459.

[2] Hearings and Arguments, Greater Winnipeg Water District, Washington, January, 1914, p. 60.

[3] Final Public Hearings, Winnipeg, February, 1916, p. 438.

[4] Final Arguments, Washington, April, 1916, p. 252.

[5] Idem, p. 250.

Mr. Thomas R. Deacon, speaking for the summer resort interests, stated that a range of levels between 1,061 and 1,058 would be satisfactory to these interests.[1]

Major E. D. Peek, in charge of navigation improvements on the United States side of the lake, stated that a range of levels between 4 and 7 feet on the Warroad gauge, or 1,057.6 to 1,060.6, was satisfactory to his Government.[2]

Navigation below outlets.

Navigation interests on the Winnipeg River between Kenora and Minaki are affected by fluctuations in the outflow from the lake. In view of the fact that at low water there is less fall and hence less current at The Dalles than at high water, moderately low rates of outflow from the Lake of the Woods are more favorable for navigation on that portion of the Winnipeg River than high rates. Very low rates of discharge, however, are unfavorable to navigation of the river immediately below the outlets of the lake. It follows then that any regulation of levels and outflow which results in either very low or very high rates of outflow from the lake is detrimental to the navigation interests on the Winnipeg River below the outlets of the lake.

Relation of proposed regulation to navigation requirements.

The recommended ordinary maximum level of 1,061.25 is not so high as to seriously affect the boathouses and docks in the northern portion of the lake, nor the docks and breakwaters in the southern portion. The recommended regulation would also result in a fairly uniform level. Only during rare periods of successive dry years would the level fall below 1,058. Perhaps once in 20 years, during a period of extreme drought, navigation would be handicapped somewhat, but the low level of 1,056 is still about 3 feet higher than the extreme low-water stage which would have been reached under natural conditions during the past 24 years.

Under the recommended regulation of outflow, the stages on the Winnipeg River below the outlets of the lake would also be more favorable than those which would prevail under natural conditions, except possibly in time of extreme flood if sufficient foresight is not exercised in providing storage capacity on the lake for flood inflows.

The existing ordinary high water of about 1,061 is the outcome of the regulation of the Norman Dam by the government of the province of Ontario for the benefit of navigation; and, moreover, navigation uses under the treaty rank before all other uses, except domestic and sanitary uses. The protection and development of navigation are functions of the Governments of the United States and the Dominion of Canada, and neither protested against the increased levels brought about by the necessary regulating operations of the Norman Dam.

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[1] Final Public Hearings, Winnipeg, February, 1916, pp. 230, 235.
[2] Further Public Hearings, Warroad, Minn., September, 1915, p. 39.

On the contrary, the Government of the United States in 1905 was seeking to maintain the minimum level at about 1,060.8.

If the regulation now recommended had in view merely the maintenance of a stage favorable to navigation interests this could best be accomplished by acquiring flowage rights around the Lake of the Woods to contour 1,062 and providing the necessary regulating works. It would cost less to buy flowage rights around the lake than to enlarge the outlets and to buy flowage rights on the Winnipeg River below the outlets with the object of maintaining the level of the lake at natural ordinary high-water mark. In the former case, however, substantially no bank protection would be required, as the lake could be held at an ordinary maximum level of about 1060 during the navigation season and lower at other times.

Fishing interests.

The most desirable level for the fishing interests is a fairly uniform level. The testimony of Mr. Paul Marschalk,[1] representing the United States fishermen, Mr. Arthur Johnson,[2] representing the Canadian fishermen, and Prof. Edward E. Prince,[3] Dominion Commissioner of Fisheries, is in full accord in this respect. A large and rapid drop in stage in a single season is particularly undesirable. The proposed regulation successfully prevents this.

Mr. Paul Marschalk gave evidence to the effect that high levels, such as prevailed in 1905 for example, when the stage was above 1062 for over a month, are detrimental to the fishing interests in the shallower southerly portion of the lake, known as the "Big Traverse."[4] Apparently this is due to an increased disintegration of the peat bogs along the south shore of the lake through wave action. The vegetable matter is scattered far out into the lake, making the water dark in color and unfit to drink. The recommended level should somewhat improve this condition as flood water stages would be lower and would occur less frequently than under the past control. The prevailing stage would be considerably higher than under natural conditions, but the annual fluctuation in level would be less than both under natural conditions and under past control.

Use of the Lake of the Woods for domestic and sanitary purposes.

Relation of regulation to Winnipeg aqueduct.

So far as the use of the waters of the Lake of the Woods for domestic and sanitary purposes is concerned, the interests primarily affected at the present time are the Greater Winnipeg Water District and the town of Warroad. The Greater Winnipeg Water District is at present constructing an aqueduct from Indian Bay on Shoal Lake as part of a gravity

[1] Further Public Hearings, Warroad, Minn., September, 1915, p. 194.
[2] Further Public Hearings, Kenora, Ontario, September, 1915, p. 412.
[3] Further Public Hearings, Warroad, Minn., September, 1915, p. 270.
[4] Public Hearings, Warroad, Minn., September, 1912, p. 97; 1915, p. 192.

water supply for the city of Winnipeg and its suburbs. This diversion of water from Shoal Lake and the Lake of the Woods for domestic and sanitary purposes was authorized by this commission on January 14, 1914, with the following reservation:

> That the present permission and order shall not be invoked or relied upon in any manner against the recommendations or report to be made by the commission on the reference to it respecting the levels of the Lake of the Woods and shall in no way interfere with the action of the commission in that regard.

The bottom of the aqueduct at the intake is at elevation 1,050.82, sea level datum. In order to be able to draw the contemplated 85,000,000 imperial gallons per day, or 158 c. f. s. from Shoal Lake, it will be necessary for the level of this lake to be at an elevation of not less than 1,058, sea level datum. Under natural conditions, however, the level of the Lake of the Woods would have dropped very much lower, and the level of Shoal Lake could have dropped to about 1,055. The interests of the city of Winnipeg would be served by a high level. Shoal Lake, however, may be maintained at any desirable level by the construction of a dam at the outlet at Ash Rapids, or water can be pumped into the aqueduct in case of low stages in the future.

Relation of regulation to Warroad sewerage and drainage.

The interests of the town of Warroad in the use of the waters of the Lake of the Woods for domestic and sanitary purposes would appear to be primarily the use of that body of water for the purposes of drainage and of sewage disposal. As the general elevation of the ground upon which the town of Warroad is built is only between 1,066 and 1,068, sea level datum, it is evident that the outlet of a gravity discharge system of sewerage could not possibly be placed above even ordinary high water in a state of nature without raising the house connections of the sewers above the bottom of the cellars and above the frost line. Even under the natural regimen of lake levels, then, it would have been necessary for the town of Warroad to install some form of sewage lift for use during high water.

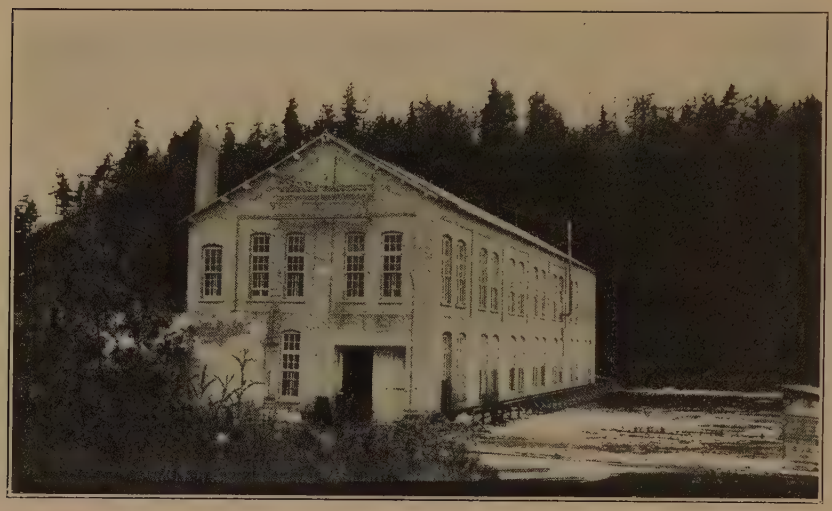
A detailed report was made on this subject by Mr. L. P. Wolff, consulting engineer,[1] and by the Minnesota State Board of Health. On the basis of these reports the commission estimates the present capitalized value of the increased cost of maintaining and operating an adequate sewerage system in Warroad under the proposed regulation to be about $12,600.

Water power at outlets of lake.

Most desirable conditions.

The fall at the outlet of the Lake of the Woods varies both with lake level and with outflow. An increase in lake stage produces a corresponding increase in fall. The available head, however, varies inversely as the outflow—that is, the

[1] Final Public Hearings, Winnipeg, February, 1916, p. 297.



a, MUNICIPAL PLANT, KENORA.

b, CONTROL DAM, PINAWA CHANNEL.

greater the outflow the less the head, because of the rise in tail-water level, which accompanies increased outflow. The most desirable condition for the water powers at the outlets of the lake would be to have both a high uniform level and a uniform outflow. It being impossible, as stated before, to obtain both of these results at the same time, the most advantageous conditions can only be determined by weighing the advantages and disadvantages resulting from different systems of regulation.

Conditions under regulation.

The recommended system of regulation will give a lake stage which averages substantially 3 feet higher than that which would prevail under natural conditions, consequently the available head at the outlets is very materially increased. Moreover the extreme low lake level under regulation will be at least 3 or 4 feet higher than under natural conditions, although it will be somewhat lower than the low-water stage of 1911, and lower than is advantageous for these plants. Only in times of extreme flood when water may need to be discharged more rapidly than it would under natural conditions would the water-power interests at the outlets enjoy less favorable conditions than those which prevailed in a state of nature. These possible high rates of discharge may never become necessary if good foresight is exercised in the matter of providing storage capacity for exceptional flood inflow into the lake.

Although the power interests at the outlets may feel that the proposed regulation is less favorable than the conditions which they have enjoyed during the past 10 years, this may be regarded as no serious objection against such regulation because these interests have enjoyed advantages that can not possibly prevail in the future unless all other interests are to be sacrificed in their behalf.[1] The interests at the outlets have enjoyed both high lake levels, i. e., high head and all the water they required. This was possible only because the water powers on the Winnipeg River did not require even the natural low-water flow, and because only a small part of the available water was being used at the outlets themselves. Moreover, the fact that the abnormally favorable conditions which these powers had enjoyed for a number of years could not prevail indefinitely was emphasized by the flood of 1916. A consideration of all facts in the situation leads to the conclusion that the water-power interests at the outlets will be better served by the proposed regulation than in any other way, provided no portion of the cost of providing this regulation is assessed against them. Certainly if the plants are protected against high tail-water levels and an additional turbine unit is installed at Kenora to furnish additional power at times of flood discharge from the lake, and during the rare periods of extreme drought when the lake may need to be drawn down to 1,056 in order to maintain a satisfactory

[1] Report of Consulting Engineers (text), p. 222.

rate of outflow in the interest of power development on the Winnipeg River, these water powers will be taken care of.

Navigation and power interests on lower Rainy River.

High levels on the Lake of the Woods and moderately high rates of discharge in Rainy River both tend to improve navigation through the Long Sault Rapids.[1] Only the construction of a dam at the Long Sault, however, will improve navigation through the Manitou Rapids.[2] The fall at the latter rapids increases with increasing stage, making them dangerous to navigation at high water.

The municipalities on the Canadian side of the Rainy River filed resolutions with the commission in 1916 recommending the construction of locks at Kettle Falls, Fort Frances, and the Long Sault Rapids, with the object of providing a navigable waterway from the Lake of the Woods to the Namakan River, a distance of about 250 miles. This would involve a dam at the Long Sault and the completion of the lock at Fort Frances, the title to which it is understood has been retained for public use by Canada, as well as the building of a lock in connection with the Kettle Falls Dam. Although neither present nor reasonably prospective navigation requirements warrant this expense, nevertheless provision should be made for the possible future construction of navigation locks in connection with all dams authorized in boundary waters.

The available fall at the Long Sault Rapids is small and varies with the level of the Lake of the Woods, but through proper cooperation with the International Falls-Fort Frances plant so as to permit some additional backwater at the latter plant a 10 to 12 foot power development at the rapids would appear reasonably feasible. Such a development would produce an average of about 9,000 horsepower. The cost of construction would be rather high, and if a large navigation lock is required it would probably be prohibitive. It might, however, be possible to interest private capital in the improvement if only a small lock for gasoline boats is required. If provision is to be made for through navigation by boats of greater tonnage, a large lock is necessary.

Water-power interests on the Winnipeg River.

Regulation will greatly increase potential water power.

On the Winnipeg River, between the Lake of the Woods and Lake Winnipeg, there are two large water-power plants in operation, another is under construction, and a number of additional desirable water-power sites are available, aggregating about 310 feet of total utilizable fall. (See

[1] Report of Consulting Engineers (plates), plate 143.
[2] Idem, plate 144, (text) plate TT.

Watershed map.) A regulated flow of 12,000 c. f. s. falling through 310 feet at 80 per cent efficiency represents 338,000 horsepower. The natural low-water outflow is about 7,000 c. f. s., and in 1911 and 1912, while an effort was being made under present control to prevent the lake from falling to a very low stage, the actual low-water outflow was reduced to less than 6,000 c. f. s. for nearly a year. This low flow was more than the power plants on the Winnipeg River required, because they were carrying a light load at that time. The demand for power has so increased, however, that even to-day such a low outflow would result in serious loss to the down-river plants. If, through regulation of the outflow from the Lake of the Woods the potential primary water power on the Winnipeg River can be increased by over 150,000 horsepower at a reasonable expense, the desirability of such regulation is apparent. As soon as the market has expanded sufficiently to absorb this increased water power its value will greatly exceed the value of the lands which will be required for flowage purposes. The commission believes that all necessary rights should be acquired at the present time, so that all interests concerned may know the ordinary stage at which it is proposed to hold the lake and the highest contour to which damage may possibly extend at some time in the future under unprecedented conditions of rainfall and run-off.

How proposed regulation affects various interests.

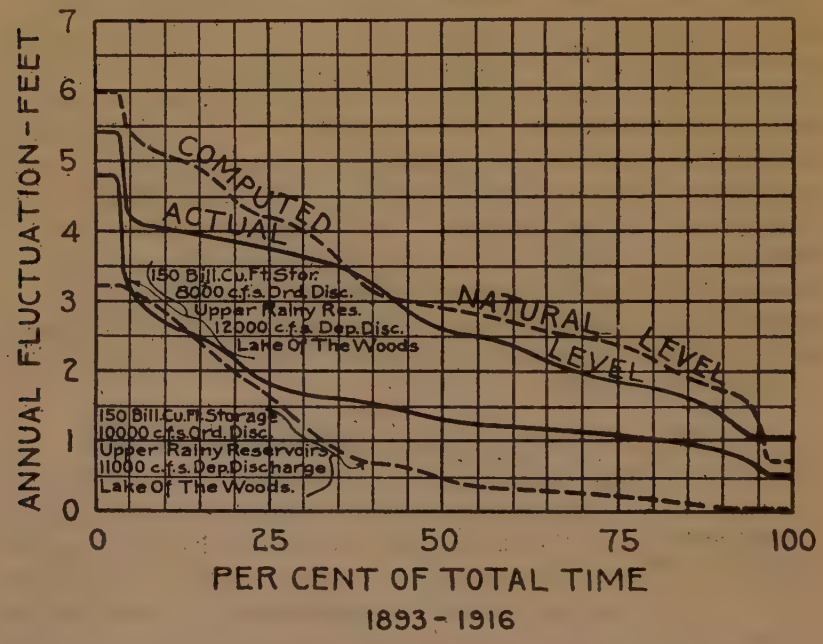
Proposed regulation aims to meet conflicting requirements.

In the preceding pages the kind of regulation favorable to the several interests using the waters of the Lake of the Woods and its shores and harbors has been briefly discussed. Evidently there is considerable conflict between the requirements of these interests. On the one hand are the navigation, fishing, and summer-resort interests, which desire regulation to secure a uniform level, and on the other are the water-power interests on the Winnipeg River, which desire regulation to secure uniform outflow, necessitating the largest practicable fluctuation in level. The riparian owners desire a low level and the water powers at the outlets a high level. In endeavoring to reconcile these differences, so far as practicable, the commission has taken a position between these extremes and recommends a regulation which will subserve all interests reasonably well and which, so far as appears practicable, will admit of the most advantageous use of these waters.

Annual fluctuations in level.

The annual fluctuation in lake level which would result from the proposed regulation, together with the annual fluctuation which prevailed in the past and that which would have prevailed if the outlets of the lake had remained as in a state of nature, is well shown by the frequency curves of figure 2.

Apparently, under regulation, the lake would be maintained at a distinctly more uniform level than actually prevailed in the past 24 years or would have prevailed during the same period under natural conditions. For example, under regulation, applied under the hydrological conditions that prevailed during the past 24 years, the annual range in levels would have been less than 2 feet for about 75 per cent of the time, whereas it actually was less than this for only 30 per cent of the time, and under natural conditions the annual range would have been less than 2 feet for only 17 per cent of the time.



FREQUENCY CURVE OF
ANNUAL FLUCTUATION
ACTUAL, NATURAL AND REGULATED LEVELS
LAKE OF THE WOODS

FIG. 2

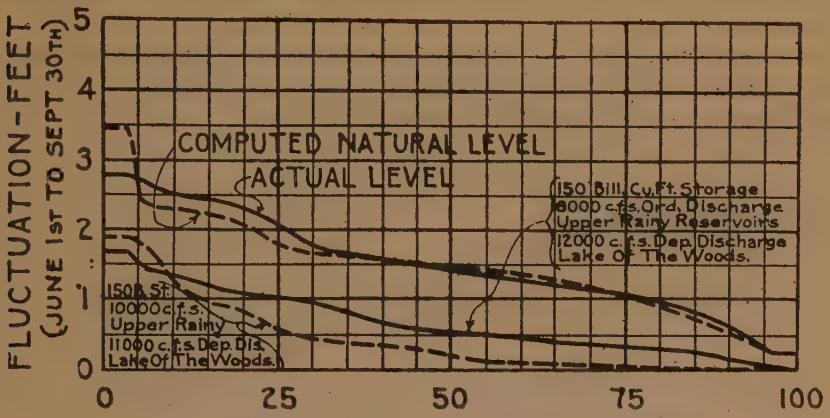
Seasonal fluctuations in level.

The seasonal fluctuations in level are shown in figure 3. Under the proposed regulation and on the basis of the hydrological conditions that have prevailed during the past 24 years, there would be less than 2 feet of fluctuation in every season between June 1 and October 1. The average seasonal fluctuation would be about half a foot as against an average fluctuation of 1.5 feet under natural conditions or under the conditions of

past control. It is further evident that if the ordinary rate of outflow from Rainy Lake is 10,000 c. f. s. the resulting annual and seasonal fluctuation of the Lake of the Woods is materially less than if the ordinary rate of outflow from that lake is 8,000 c. f. s.

A flexible minimum.

As the power developments on the Winnipeg River are being made with a view to utilizing only the dependable outflow from the Lake of the Woods and without provision for auxiliary steam power to be used in time of low water, it is evident that whichever rate of discharge from the lake is used as the



FREQUENCY CURVE OF
FLUCTUATION - JUNE 1ST TO SEPT. 30TH
ACTUAL, NATURAL AND REGULATED LEVELS
LAKE OF THE WOODS

FIG. 3

dependable rate upon which the projects are based, this rate must be substantially maintained in the future. This dependable rate may fairly be based upon the hydrological conditions which have prevailed during the past twenty-four years, but it is unreasonable to specify an inflexible low-water stage below which the lake can not be drawn, irrespective of the extraordinary hydrological conditions that may prevail.

In view of this, the commission recommends that if unprecedented conditions should occur in the future the lake may be drawn below 1,056, even during the navigation season, on such terms and conditions as it may impose.

Regulation desirable.

The recommended ordinary maximum level is substantially equal to mean high water of the past 24 years as shown by figure 1. The proposed enlargement of the outlets and the storage of water on the upper Rainy watershed will greatly reduce the annual fluctuation in lake level, as shown in figures 2 and 3, in the interest of navigation, fishing, and summer outing, and will also substantially reduce extreme high water on the lake for the benefit of all interests.

The proposed draft on storage will permit of greatly increasing the dependable outflow from the lake in the interest of water-power development, both at the outlets and on the Winnipeg River below. The commission believes that with adequate provision for compensation and protection for all interests injuriously affected the proposed regulation is highly practicable and desirable.

IX.—QUESTION TWO.

The second question of the reference deals with the amount and value of the land which will be submerged at the recommended level in case this level is higher than the "normal or natural level."

Meaning of "normal" or "natural."

Since the reference originated in the United States, it is reasonable to look for indications of the meaning of the expression "normal or natural level" in the official correspondence out of which the reference originated. Both the words "normal" and "natural" are used in this correspondence, and the word "natural" is also used in the treaty itself. The word "natural" is used with only one meaning, that is, signifying a state of nature. The word "normal" is used as synonymous with the word "natural" by Colonel Naff in 1896, when he said: "* * * the present stage of water is an 'abnormal one.'" It was used in 1908 with the same meaning by the United States Army Engineers, but with qualifying phrases, viz: "The normal level of the lake under natural conditions"; and again, "Above its normal level as existing at the time they located there." The word "normal," when referring to present conditions on the lake, is always used alone and did not come into such use until after the stage to which it referred had become the ordinary, normal condition. When so used, it referred to the "mean level of the lake during the open season," or, as used in Canada, "the ordinary summer level," and actually represented a stage of about 1,060.5.

The United States Engineers who used the word "normal" when referring to a stage of 1,060.8 frequently used the word "natural," but always with the same significance, viz: the condition of nature. Since the word "natural" was never used in any other sense than as signifying the condition of nature, and since the word "normal" was used to signify both natural and existing conditions, the expression "normal or natural level" can not fairly be interpreted as meaning any other level than that which prevailed in a state of nature, and the commission has so construed it. There is good ground for concluding, however, that the normal level as existing to-day was believed to be the natural level so far as the ordinary high stages were concerned.

The view that the "normal" level of to-day is also the "natural" level of the lake prevailed in Canada as well as in the United States. The Rollerway Dam, a long submerged weir, was built in 1887 with

the avowed purpose of raising the low-water level and, as a matter of fact, as it existed between 1892 and 1898, it raised the low level about 3 feet and the extreme high level less than 1 foot. When the Norman Dam was placed in operation in 1898, it very evidently was not the intention to raise the level of the Lake of the Woods to a stage at which damage would be inflicted upon riparian owners. The contract between the Keewatin Power Company and the Ontario Government covering the control of the dam provided that the water should be maintained at "the ordinary summer level."

At the hearings of the commission in Kenora in 1912, Mr. T. R. Deacon, speaking of conditions at Warroad at a lake stage of about 1,060.5 said, "* * * I do not think that any land should be overflowed at the present height of the waters."[1]

Dr. Schnarr, who came to Kenora in 1887, stated, "We want to keep the lake in just about its natural condition. We contend that the lake naturally has been much higher than it is now. * * * There is no question of doubt that any lands that are flooded to-day (lake level about 1,060) are naturally flooded, and have been from time immemorial. Any lands that have been flooded up to 2 feet above the present level are lands that are oftener flooded than not."[2]

Mr. George Drewry stated, "We were interested in holding the water at a fixed level, and that level is what we term the old normal level before there were any dams in here at all."[3]

The record clearly shows that the United States was uncertain as to whether or not the prevailing stage on the Lake of the Woods exceeded natural ordinary high-water mark. The settlers had protested against alleged flooding of their lands as the result of the construction of dams at the outlets. The General Land Office of the Department of the Interior held that the prevailing stage was an abnormal one. When subdividing the Indian lands on the south shore it did not recognize the conditions then existing as being permanent, or the meandered shore line would have been placed near the water's edge instead of in places more than a mile out in the lake. These surveyors were subdividing land, not water. The Corps of Engineers of the War Department, as represented by the local officials, on the other hand, claimed that no records were available from which to determine the natural level of the lake and that the stage of 1,060.8 which they desired for navigation purposes was not above the "normal" level of the lake, but was actually about a foot below the existing high-water mark, which, it was believed, had not been changed through the operation of the Norman Dam; that is, they believed the "normal" level to be the "natural" level.

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[1] Public Hearings, Kenora, Ontario, September, 1912, p. 142.
[2] Idem, p. 149.
[3] Idem, p. 155.

ROCKS SHOWING HIGH-WATER MARK.

Since the United States did not know what the natural level of the lake was, it was unable to determine the merits of the protests of the riparian owners or the justness of their claims for injury on account of prevailing levels. Moreover, the United States knew that, on its own side at least, the level of this lake could not be maintained for the benefit of navigation or for any other purpose, above ordinary high water under natural conditions, without compensating riparian owners, and that such compensation had not been paid. Nor had the United States at any time taken steps to maintain the lake above what it believed was ordinary high water under natural conditions.

Naturally, then, the United States would want to know whether the recommended level was higher than the level of the lake under natural conditions, in order that those whose lands would be submerged might receive fair compensation.

If, in view of the fact that the United States engineers in 1906, in 1908, and again in 1911 told their Governments what the normal level under existing conditions was, viz: 7.2 feet on the Warroad gauge, the United States, through its legal representatives who framed the reference, meant to refer to the "normal" level *under existing conditions* instead of *under natural conditions*, they might be expected to have used the figure given them by their engineers instead of the uncertain phrase "normal or natural level."

In the light of all the facts and circumstances the commission has concluded that the two Governments desire to know whether the recommended level is higher than the normal level under natural conditions and has answered this part of Question II in the affirmative.

Prevailing levels under natural conditions.

Having secured information through public hearings in September, 1912, and otherwise, of the extent to which the waters of the Lake of the Woods and the shores and harbors of the lake and the waters flowing into and from the lake were being used by different interests, and the character of regulation which the various interests desired, together with information relating to the questions of difference which have arisen between the two Governments and the inhabitants of the two countries out of the use of these waters, the commission authorized its engineers to collect such further data and make such technical investigations as were required as the basis for a reply to the questions of the reference. It was apparent from the outset that riparian owners around the Lake of the Woods and around the upper reservoirs, which it was anticipated would be of considerable service in maintaining any proposed level on the Lake of the Woods or in securing equalization of outflow, believed that the levels of these several lakes had, for a number of years, been maintained considerably above natural ordinary high-water mark in disregard of their

rights, since no flowage easement had been acquired. In view of this, and with the belief that the two Governments desired to know all the "facts and circumstances of the particular questions and matters referred" the commission authorized its engineers to secure all data necessary to a determination, if possible, of the level of the Lake of the Woods, of Rainy Lake, and of the lakes above Kettle Falls, under natural conditions.

As the first alterations were made in the outlets of the Lake of the Woods about 30 years ago, it is not surprising that no actual records of observed natural levels on this lake, referred to a preserved datum, have been found. Much evidence was presented, however, by old residents around the lake, and valuable physical evidences of early prevailing stages were found. The most important physical evidence is the winding channels of the stream where they enter the lake through what are now bays or inlets.[1] These channels could not possibly have been either formed or maintained at the lake stages that have prevailed during the last 24 years.

After collecting all available data in cooperation with Canadian and United States governmental departments, and after much study, the consulting engineers succeeded in computing the levels which would have prevailed on the Lake of the Woods during the past 24 years if the outlets had remained as in a state of nature. The fundamental data, forming the basis for this work, are all presented in their report. These data, while in a measure conflicting, lent themselves well to a thorough analysis, and the results of the computations are believed to be entirely reliable. Good records were eventually obtained of the inflow into the lake and of the outflow from the lake from October, 1892, to date. The relation between lake stage and outflow was determined, and from these, briefly speaking, the natural levels were computed. These levels are given in Table 73 and on Plates 114 to 125 of the engineers' report. No exception was taken by any of the parties in interest to these conclusions of the engineers. They are in accord with the evidence and may be accepted as fairly representative of the levels which would prevail under natural conditions on the Lake of the Woods during any other period of 25 years.

Surveys of shore lands.

In order to permit full consideration of the advantages and disadvantages of various levels and systems of regulation, the commission authorized its engineers to make detailed surveys along the shore of the Lake of the Woods between a sufficiently wide range of levels to obtain all the necessary information for a proper consideration of the questions involved, and as a consequence these surveys were carried on between contours 1,054

[1] See Report of Consulting Engineers (Atlas), sheets 10, 14.

and 1,064, extending on improved lands to 1,066. The engraved maps prepared on the basis of these surveys are presented in the atlas. The field books, plane-table sheets, and original maps are filed in the offices of the commission.

The field data secured from these surveys permitted the platting of 1-foot contours for most of the land area around the Lake of the Woods. The lake level at the time of the surveys ranged between 1,060 and 1,061, thus making necessary the employment of special topographic methods below this level. The total surveyed area, including over 7,000 acres of land examined by reconnaissance methods, aggregates over 95,000 acres.

The present character of the shore lands is well shown in the engineers' report.[1] Much of the land near the shore has a covering of peat, but except for large areas around Buffalo Bay, this usually disappears at about elevation 1,060. The timber begins at about elevation 1,061. Only 342 acres of cultivated land will be affected by the proposed regulation. Of this area 275 acres are in the United States. A total of 1,760 acres in both countries of what is termed "grass land" will be affected. No marsh land covered with coarse, wild grass is included in this area.

It was early perceived that a reply to the second question of the reference could not be limited to lands actually submerged. In some places along the shore of the lake, where the land was high and not subject to flowage, the banks, due to wave action, were breaking down. In other places public and private structures were found close to the prevailing lake stage. Realizing that all property rights affected must receive consideration, all necessary data were secured, either directly by the commission's engineers or through cooperation with Government departments, regarding all interests and structures around the lake that might be affected by various levels and systems of regulation. Most of these data appear in the engineers' report.

The principal data relating to land areas are summarized in tabular form in the volume of text and are represented also upon the contour maps in the atlas. The maps of the atlas show conditions as they prevailed on the lake at the time of the survey. Maps have also been prepared and filed in the offices of the commission showing the old meandered shore line as located by the United States General Land Office surveyors. The meander corners have practically all been washed away; the shore line, however, was located on the commission maps on the basis of the distances given on the Land Office plats to the nearest section corners, most of which were found by the commission's engineers.

[1] Report of Consulting Engineers (text), Plates E to K.

Submerged areas computed from meander line.

The instructions under which the south shore lands in Minnesota were surveyed required the establishment of the meander line at what was described as "ordinary high-water mark." At the time of the surveys, 1894 to 1896, the lake was and for about seven years had been considerably above its natural stage. The low lands along the south shore were under water and the meander line was evidently taken as the dividing line between open water on the one hand and willow brush or marsh grass on the other. This meander line is a considerable distance lakeward from the 1,059 contour, which we believe, as previously stated, fairly represents natural ordinary high-water mark. However, lands were patented to the settlers on the basis of the acreage shown above the meander line, which was supposed to be ordinary high-water mark, and many of these settlers have suffered real damage in the past. In view of these considerations, the commission has recommended that the area of submerged lands be computed from the meander line.

When discussing the significance of certain phrases relating to levels, counsel for various interests dwelt at some length upon what could reasonably be done in a study of levels on the Lake of the Woods, in order to determine what "ordinary high-water mark" would have been on the lake in a state of nature. This question owes its importance to the fact that the United States Federal Government, in the interests of navigation, holds an easement to raise the level of navigable waters to "ordinary high-water mark."

On the Lake of the Woods the higher lake stages prevailing under control have obliterated the vegetation growing around the lake at what was the "ordinary high-water mark" in a state of nature. Moreover, the stages that have prevailed on the lake during the past 20 years have been much more uniform than those which would have prevailed under natural conditions. It is, therefore, not now feasible satisfactorily to determine "natural ordinary high-water mark" by effecting comparisons between the actual controlled levels and the computed natural level. In view of these considerations, "natural ordinary high-water mark" can probably be reasonably determined by deduction from the computed natural levels which would have prevailed on the lake during the past 24 years. The commission's engineers have made this study and been led to the conclusion previously stated—and which appears reasonable—that "natural ordinary high-water mark" on the Lake of the Woods was approximately at elevation 1,059. This stage would have prevailed 22 per cent of the time during the summer months of the past 24 years and represents the mean of all stages above the average stage prevailing during the months of June to September, inclusive. The ice on the lake usually

breaks up about the middle of May. If May 15 to October 31 is adopted as the summer season, the mean high-water stage during this season is reduced by only about 0.2 feet.

Submerged or injuriously affected lands.

The recommended ordinary maximum level of 1,061.25 is 2.23 feet higher than the computed natural mean high level of the Lake of the Woods and 0.03 feet lower than the actual mean high level which has prevailed during the past 24 years. Notwithstanding the proposed increased discharge capacity of the outlets, it will be impossible to discharge the water as rapidly as it will run into the lake in time of exceptional floods. Under such conditions some of the flood inflow must be temporarily stored on the lake, to be wasted as fast as conditions at the outlets permit. The amount of this excess storage required will vary with the flood inflow. Under the most unfavorable conditions of the past 24 years about 1.25 feet of excess storage would have been required, but a factor of safety must be provided as still greater rates of inflow have occurred in earlier years and may recur in the future. Moreover, the ordinary maximum stage will prevail nearly 80 per cent of the time, so that each season the stage along the south shore may be expected to rise half a foot or a foot above the mean for about a day at a time as a result of high northerly winds. During storms driftwood will be carried inland over the fields to about elevation 1,062. This is well illustrated by the storm of June 5, 1913, referred to by the engineers.[1]

According to the evidence, the allowance to be made for the effect of seepage is about 1.5 feet.[2] This allowance, however, varies considerably with the character of the soil, particularly the subsoil below the layer ordinarily plowed. Where the subsoil is clayey the passage of water is so slow that the moisture content of the surface soil is determined primarily by evaporation and rainfall. During dry weather such soils in fields a few hundred feet removed from the lake shore are dry even though their surface may not be above the elevation of the water in the lake. During rainy weather such soils have a tendency to become water-logged irrespective of their elevation above the lake level. This fact is demonstrated by the effects of tile drainage on heavy clay soils in upland, rolling fields.

An ordinary maximum level of 1,061.25 and 1.25 feet allowance for excess storage plus 1.5 feet for seepage brings the contour, up to which all lands will be more or less injuriously affected by the proposed regulation, to 1,064.

The commission having concluded to recommend that flowage be obtained up to contour 1,064 found it necessary to adopt a range of

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[1] Report of Consulting Engineers (text), Plate E.

[2] Public Hearings, Warroad, September, 1912, pp. 89–90; Final Public Hearings, Winnipeg, February, 1916, pp. 222–223.

values that would be applicable to the various classes of privately owned and filed on land adjoining the Lake of the Woods that would be affected at the recommended level. As all such areas in both countries had to be investigated, some being entirely removed from railway facilities and remote from settlement, the commission after careful consideration of all factors fixed the following range of values:

Cultivated lands, $75 to $35 per acre; grass lands, $50 to $25; per acre; grass land with scattered poplars, $35 to $15 per acre; lands covered with deciduous trees, $20 to $10 per acre; lands covered with mixed deciduous and coniferous trees, $15 to $5 per acre; coniferous swamp, $5 to $3 per acre; lands covered with willow and brush, $5 to $3 per acre; open marsh or bog, $5 to $1 per acre.

The commission wishes to emphasize the fact that no part of its investigation has been carried out with greater care than that involving the determination of the value of these various classes of lands adjoining the Lake of the Woods. The result of its efforts to apply values to lands within the range above specified, with an additional allowance for lands in the neighborhood of Warroad, yielded the results embodied in the following tables:

SUMMARY OF AREAS AND VALUES, LAKE OF THE WOODS, DECEMBER 31, 1915.

Lands submerged or injuriously affected by proposed regulation.

TOTAL, UNITED STATES.

	Privately owned and filed on.		Federal.		State.		Total.	
	Acres.	*Value.*	*Acres.*	*Value.*	*Acres.*	*Value.*	*Acres.*	*Value.*
Lost land; old meandered shore line to present [1]	1,583	$18,000	2,940	$2,940	33	$33	4,556	$20,973
Present shore line to contour 1059	1,395	3,459	4,050	4,050	363	363	6,308	7,872
Old meandered shore line to contour 1059	3,478	21,459	6,990	6,990	396	396	10,864	28,845
Contour 1059 to 1062	5,412	50,229	6,292	6,292	319	319	12,023	56,840
Old meandered shore line to contour 1062	8,890	71,688	13,282	13,282	715	715	22,887	85,685
Contour 1062 to 1064	4,614	81,805	3,718	3,718	135	135	8,467	85,658
Old meandered shore line to contour 1064	13,504	153,493	17,000	17,000	850	850	[2]31,354	[2]171,343

[1] This includes loss of land where high banks have been eroded and fishermen's buildings damaged.

[2] If the public land between the old meandered shore line and the 1059 contour is omitted, these totals become 23,968 acres and $163,957, respectively.

NOTE.—All lands other than those which were in private ownership on Dec. 31, 1915, or had been filed on, are provisionally entered at a uniform rate of $1 per acre. Some of these lands are subject to a lien for ditch benefits amounting to from about $1 to $2.50 per acre. Other lands have since passed into private ownership. "Lost land" includes all areas lying between the meander line shown on the plats made by the Government land surveyors and the shore line shown on the maps of the atlas accompanying the report of the consulting engineers. The meander line shown on the maps of the United States General Land Office represents what the surveyors, according to the instructions of the Land Office, regarded as ordinary high-water mark at the time of the survey. The meander line shown on the Ontario maps represents the water's edge at the time of the surveys.

CAST UP SHORE LINE ON SOUTH SHORE.

Lands submerged or injuriously affected by proposed regulation—Continued.

TOTAL, CANADA.

	Privately owned and filed on.		Provincial.		Dominion.		Indian.		Total.	
	Acres.	*Value.*	*Acres.*	*Value.*	*Acres.*	*Value.*	*Acres.*	*Value.*	*Acres.*	*Value.*
Lost land; old meandered shore line to present [1]	785	$4,100							785	$4,100
Present shore line to contour 1059	477	1,190	2,590	$2,590	2,184	$2,184	1,161	$1,161	6,412	7,125
Old meandered shore line to contour 1059	1,262	5,290	2,590	2,590	2,184	2,184	1,161	1,161	7,197	11,225
Contour 1059 to 1062	1,962	15,778	8,071	8,071	8,367	8,367	5,579	5,579	23,979	37,795
Old meandered shore line to contour 1062	3,224	21,068	10,661	10,661	10,551	10,551	6,740	6,740	31,176	49,020
Contour 1062 to 1064	1,446	23,687	4,972	4,972	6,060	6,060	3,073	3,073	15,551	37,792
Old meandered shore line to contour 1064	4,670	44,755	15,633	15,633	16,611	16,611	9,813	9,813	[2]46,727	[2]86,812

[1] This includes loss of land where high banks have been eroded and fishermen's buildings damaged.
[2] If the public land between the old meandered shore line and the 1059 contour is omitted, these totals become 40,792 acres and $80,877, respectively.

NOTE.—All lands other than those which were in private ownership on Dec. 31, 1915, or had been filed on, are provisionally entered at a uniform rate of $1 per acre. Some of these lands have since passed into private ownership. "Lost land" includes all areas lying between the meander line shown on the plats made by the Government land surveyors and the shore line shown on the maps of the atlas accompanying the report of the consulting engineers. The meander line shown on the maps of the United States General Land Office represents what the surveyors, according to the instructions of the Land Office, regarded as ordinary high-water mark at the time of the survey. The meander line shown on the Ontario maps represents the water's edge at the time of the surveys.

TOTAL, UNITED STATES AND CANADA.

	Privately owned and filed on.		Federal, Dominion, State, Provincial, or Indian.		Total.	
	Acres.	*Value.*	*Acres.*	*Value.*	*Acres.*	*Value.*
Lost land; old meandered shore line to present [1]	2,368	$22,100	2,973	$2,973	5,341	$25,073
Present shore line to contour 1059	2,372	4,649	10,348	10,348	12,720	14,997
Total, old meandered shore line to contour 1059	4,740	26,749	13,321	13,321	18,061	40,070
Contour 1059 to 1062	7,374	66,007	28,628	28,628	36,002	94,635
Old meandered shore line to contour 1062	12,114	92,756	41,949	41,949	54,063	134,705
Contour 1062 to 1064	6,060	105,492	17,958	17,958	24,018	123,450
Old meandered shore line to contour 1064	18,174	198,248	59,907	59,907	[2]78,081	[2]258,155

[1] This includes loss of land where high banks have been eroded and fisherman's buildings damaged.
[2] If the public land between the old meandered shore line and the 1059 contour is omitted, these totals become 64,760 acres and $244,834, respectively.
NOTE.—All lands other than those which were in private ownership on Dec. 31, 1915, or had been filed on, are provisionally entered at a uniform rate of $1 per acre. Some of these lands are subject to a lien for ditch benefits amounting to from about $1 to $2.50 per acre. Other lands have since passed into private ownership. "Lost land" includes all areas lying between the meander line shown on the plats made by the Government land surveyors and the shore line shown on the maps of the atlas accompanying the report of the consulting engineers. The meander line shown on the maps of the United States General Land Office represents what the surveyors, according to the instructions of the Land Office, regarded as ordinary high-water mark at the time of the survey. The meander line shown on the Ontario maps represents the water's edge at the time of the surveys.

Other property rights affected.

The maintenance of the Lake of the Woods at a relatively uniform level of 1,061.25 will aggravate the erosion of exposed high lands not subject to actual flooding until a new beach is formed upon which the waves can beat. The commission believes that, except where bank protection is provided, a strip of land about 200 feet in width should be condemned for flowage purposes along all high banks now subject to erosion where the land is held in private ownership, and that a flowage easement should be retained by the Governments over all similar lands patented to

settlers hereafter. The portions of the shore line where the most serious erosion of high banks has occurred in the past are those between Long Point and Zippel Creek and around Oak Point.

The banks of Warroad River, where subject to erosion, must be protected. Good rock or concrete riprap placed after the banks have been graded to a reasonably uniform slope of about 2 horizontal to 1 vertical will serve this purpose except in the vicinity of the town dock, where a concrete retaining wall should be built for a few hundred feet. To prevent the encroachment of the lake from the east, the Great Northern Railway spur track east of the town should be moved westerly to near the 1,064 contour. A good trench should be dug and riprap placed on the lakeward side of the embankment extending to the bottom of the trench.

Some docks, boathouses, and other water-front improvements in the vicinity of Baudette, Minnesota, and Rainy River, Ontario, and the sawmill at Clementson, Minnesota, will require minor modification and protection.

Docks, boathouses, and other improvements in the northerly portion of the lake will not be disadvantageously affected. The effect on drainage and sewerage at Warroad has already been mentioned. This matter is fully discussed on page 297 et seq. of the Final Public Hearings, Winnipeg, February, 1916.

Effect of lake level on ditch system.

The operation of the ditch system of northern Minnesota is not adversely affected by any particular level of the Lake of the Woods. This fact was well brought out by the testimony of Colonel Mason M. Patrick, Corps of Engineers, United States Army, who appeared before the commission at the hearing in Winnipeg in 1916.[1] Under the conditions of slope prevailing on the south shore of the Lake of the Woods silting will take place where the flowing water from the ditch enters the quiet water of the lake, and a change in lake level will merely result in transferring the point of deposit from one level to the other. Moreover, the effect of any given lake level is practically limited to the reach from the mouth of the ditch to the point where the ditch bottom rises above the lake level. Further information regarding this matter will be found in the supplement to this report.

[1] Final Public Hearings, Winnipeg, 1916, pp. 374–375.

X.—QUESTION THREE.

Enlarging the outlets.

The first requirement for the maintenance of the recommended level is the enlargement of the outlets so as to secure an aggregate discharge capacity of 47,000 c. f. s. at a lake stage of 1,061. This will give a capacity of 48,000 c. f. s. at the ordinary maximum level of 1,061.25. On account of flooding and loss of power at the outlets and the damage resulting to riparian owners on the Winnipeg River below the outlets, from high rates of discharge, it is desirable to fix a maximum tailwater level which will not be exceeded in time of flood. The stage recommended is that corresponding to a discharge of 48,000 c. f. s. from all outlets. This stage is approximately 1,049 at the Winnipeg River bridge at Keewatin and represents a stage about 1.25 feet higher than natural extreme high-water mark.

Of the total discharge, about 40,000 c. f. s. at a stage of 1,061 must be passed through the western outlet. This is about 11,000 c. f. s. greater than passed through this outlet in a state of nature. About 45,000 cubic yards of rock excavation must be made in the vicinity of the Canadian Pacific Railway bridge and at the site of the old Rollerway Dam to provide the necessary discharge capacity. The cost of making this excavation is dependent largely upon the conditions under which the work will be done. It would be unwise to attempt the work during a wet year. During a year of average precipitation the western outlet could be completely closed off by a cofferdam from about September 1 to May 1, so as to permit making the excavation in the dry. It would also appear desirable to provide for additional discharge capacity through the eastern outlet during the enlargement of the western outlet, and then to place an additional turbine unit in the Kenora Channel later to furnish supplementary power. By providing headworks and discharging through an excavated channel east of the Kenora power house and also through the uncompleted portion of the power house after it has been properly remodeled, it should be possible to discharge at least 7,500 c. f. s. through the eastern outlet.

The headworks of the old Keewatin Lumber & Manufacturing Company's headrace require replacement with a permanent structure. A little excavation will provide for a discharge of at least 500 c. f. s. through this outlet and about 2,000 c. f. s. can be discharged through Mills A and C at Keewatin, making a total of at least 10,000 c. f. s. If

at the time the excavation is made in the western outlet a considerable storage capacity is available on both Rainy Lake and the Lake of the Woods, and if the Winnipeg River power plants do not require more than about 10,000 c. f. s. from the Lake of the Woods, the western outlet can be coffered off and the excavation made in the dry.

The controlling works.

The proposed regulation will increase the value of the Norman Dam as a power site for manufacturing purposes, but possibly not for hydroelectric purposes, except in conjunction with a steam auxiliary plant, on account of the low head remaining when water is being discharged from the lake at high rates. If all the power plants at the outlets are willing to forego the small increase in head resulting from maintaining the level of the lake as close to the ordinary maximum stage as possible well into the spring, and will agree to the drawing down of the reservoir in anticipation of spring floods, no extreme high rates of discharge will ever become necessary, and the value of the Norman Dam as a power site will be correspondingly increased. The commission believes such regulation to be desirable, but no international interests are involved. It is purely a domestic matter for Canada to determine. In case such regulation is adopted, it will be feasible to install a power plant in the Norman Dam. The best procedure would appear to be to remove the rock fill and then to build the power plant in this location, using the present sluices as wasteways under the proposed regulation.

Flowage rights on the Winnipeg River.

A detailed examination of conditions on the Winnipeg River below the outlets was made by the Department of Public Works of Canada. The possibility of channel enlargements in the vicinity of The Dalles, with a view to lowering the tail-water level at Keewatin in time of flood discharge from the lake, was carefully considered. The cost of excavation, however, appeared much more than any benefits which would be derived from the work. Complete data were collected regarding the structures and riparian lands which would be affected at different rates of discharge from the lake. Most of these structures were built during comparatively low water and were placed considerably below natural extreme high-water mark.[1] It is very doubtful whether boathouses built at an elevation permitting their advantageous use either under natural conditions or under the conditions of past control, necessarily including such high-water stages as those of 1916, would need to be modified under the proposed regulation. If proper foresight is exercised in providing some storage capacity in anticipation of flood inflows, it is improbable that flood stages will occur more frequently under the proposed regulation than either under natural conditions or under past control. However, if all structures which would be affected by flood stages are raised above extreme high-

[1] Final Public Hearings, Winnipeg, February, 1916, p. 279.

ONE OF THE UPPER LAKES.

water mark and flowage rights are acquired over all cultivated and meadow lands affected, the total cost based on the examination made by the Department of Public Works of Canada is estimated at about $30,000.

Equalizing the outflow.

In order to secure the most advantageous use of the waters flowing from the Lake of the Woods in power development on the Winnipeg River, it is necessary to equalize the outflow as far as practicable. It is particularly necessary to increase the low-water flow—that is, the *dependable* outflow—as this will govern the size of the water-power plant capacity to be installed at the different sites. Under the system of regulation recommended only the upper 2 feet of reservoir storage capacity on the Lake of the Woods need be used to effect such equalization of flow as will be necessitated by the ordinary hydrological conditions prevailing about 80 per cent of the time. In order to maintain a satisfactory rate of dependable outflow indefinitely into the future, however, it will be necessary to draw the lake down several feet more during a series of exceptionally dry years, such as may recur about once in twenty or twenty-five years.

In determining the most desirable extreme range of fluctuation in levels required to effect the desired equalization of outflow the advantages resulting from each foot increase were balanced against the injurious effects resulting from securing this range, either by increasing the ordinary maximum level or by reducing the minimum level. The cost of securing each foot increase in range became larger and larger while at the same time the resulting increase in dependable outflow became smaller and smaller. By balancing the cost of securing each foot increase in range through an increase in the ordinary maximum level against the cost of securing it through reducing the minimum level the most advantageous ordinary maximum was also obtained. The principal interests affected by increasing the ordinary maximum level are the riparian owners, including the town of Warroad, and the fishing interests in the United States portion of the lake and the summer resorts in the Canadian portion of the lake. The principal interests affected by reducing the minimum level are the water-power plants and lumbering interests at the outlets and the navigation interests in both countries. The interests most affected by a range in levels are the fishing interests. In endeavoring to arrive at the most desirable level for the Lake of the Woods, and the extent to which it is practicable and desirable to equalize the outflow by permitting a draft on stored water, the commission found it extremely difficult to evaluate the injurious effect of high levels on fishing in the Big Traverse, of low levels on the navigation interests, and of fluctuations in level on the

fishing interests in both countries. The ordinary maximum level and the system of regulation here recommended, it is believed, come as near as is practicable to securing the most advantageous use of these waters by all interests concerned.

The more the inflow into the Lake of the Woods is equalized the more readily can the recommended level be maintained within a small fluctuation, and the greater is the dependable outflow that can be secured from any given extreme range in level of the Lake of the Woods. The principal storage reservoirs available for equalizing the inflow into the lake are those already constructed by private capital on Rainy Lake and the lakes above Kettle Falls. On Rainy Lake there is at present 70 billion cubic feet of storage available between the levels of 497 and 490, and 30 billion cubic feet on Namakan and adjoining lakes above Kettle Falls between the levels of 508.5 and 497. The existing power plant at International Falls and Fort Frances, just below the outlet of Rainy Lake, has sufficient turbine capacity to utilize substantially 10,000 c. f. s. under normal head. It is to the interest of this plant to use water at this rate whenever stored water is available and there is a market for the product of the mills. As the runoff from the watershed tributary to Rainy Lake amounts to 60 per cent of the total runoff from the Lake of the Woods watershed, and a rate of discharge of 10,000 c. f. s. from Rainy Lake is between 80 per cent and 90 per cent of the rate at which water will ordinarily be discharged from the Lake of the Woods under the proposed regulation, it is apparent that the upper Rainy reservoirs will ordinarily be only partially full when the Lake of the Woods reservoir is completely full. In other words, while the Lake of the Woods will be full about 80 per cent, Rainy Lake will be full only about 40 per cent of the time. As a consequence, the probabilities are that if water is being drawn from Rainy Lake at an average rate of 10,000 c. f. s. that the lake will not be full at the beginning of a series of dry years, even though the Lake of the Woods would be full under the same hydrological conditions. If water is being drawn from Rainy Lake at an average rate of about 10,000 c. f. s. the available 100 billion cubic feet of storage on the upper Rainy watershed will be of relatively little service in increasing the dependable outflow from the Lake of the Woods, although it will reduce the ordinary fluctuation in the level of that lake by materially equalizing the inflow into the lake. The records of the past 24 years indicate that if the outflow from Rainy Lake is reduced to approximately 8,000 or 8,500 c. f. s. whenever stored water is being drawn upon, both Rainy Lake and the Lake of the Woods will be full at the beginning of a dry spell, and the dependable outflow from the Lake of the Woods will be increased by substantially 1,000 c. f. s. or 10 per cent, with a corresponding increase in the potential water power on the Winnipeg

River of about 25,000 horsepower and a loss of substantially 1,000 horsepower at International Falls and Fort Frances.

The dependable outflow from the Lake of the Woods, however, can also be increased by additional storage on the upper Rainy watershed. This additional storage will not only benefit the water powers on the Winnipeg River, but it will also aid in maintaining the recommended level on the Lake of the Woods and increase the available water power at International Falls and Fort Frances.

The commission has recommended that in order to secure the most advantageous use of the waters of the Lake of the Woods and of the waters flowing into and from that lake it is practicable and desirable to secure at least 45 billion cubic feet of additional storage capacity on the upper Rainy watershed. By drawing Rainy Lake down another half foot in time of extreme low water, a full 150 billion cubic feet storage would become available. If this entire 150 billion cubic feet storage capacity is used primarily in the interest of the International Falls and Fort Frances plants it will, nevertheless, directly increase the dependable outflow from the Lake of the Woods in the interest of the Winnipeg River water powers by 360 c. f. s. This is equivalent to the increase in flow that could be secured by half a foot additional draft on the Lake of the Woods. Moreover, every increase in dependable outflow which is secured by equalizing the inflow into the Lake of the Woods instead of by increasing the draft on that lake assists in maintaining the recommended level with less ordinary fluctuation.

Increased storage on the upper Rainy watershed also reduces the occasional extreme stages on the Lake of the Woods in time of flood, thus permitting the maintenance of an ordinary maximum stage on that lake about 3 inches higher than with the present storage on Rainy Lake, and about 6 inches higher than with the natural outflow from Rainy Lake, without encroachment on the margin of safety provided by flowage rights acquired to contour 1,064. The net result, therefore, of 150 billion cubic feet of storage on the upper Rainy watershed is to increase the dependable outflow from the Lake of the Woods by at least 650 c. f. s. corresponding to an increase of at least 17,000 horsepower in the potential water power on the Winnipeg River and of about 2,500 horsepower on the Rainy River. Inasmuch as the closing down of the International Falls-Fort Frances plants over Sunday during the winter and the reduction in flow to about 5,000 c. f. s. on Sunday during the navigation season, and all other shutdowns or reductions of output in anticipation of low water, will reduce the ordinary rate of water consumption somewhat, the real increase in potential water power on the Winnipeg River will probably be not less than 25,000 horsepower.

Flood reserve.

The discharge of water from Rainy Lake at an ordinary rate of 10,000 c. f. s. instead of 8,000 c. f. s. also assists in preventing the Lake of the Woods from exceeding its ordinary maximum level in time of flood, because a greater amount of storage capacity is always available for the storage of flood water, even without water having been wasted in anticipation of flood inflows. Greater storage capacity reduces the rate at which it is necessary to discharge the flood water after the reservoir is full, or the excess water to be stored on the lake above the ordinary maximum stage. The restriction of the ordinary rate of outflow from the Lake of the Woods to a dependable rate of about 11,000 c. f. s. on the other hand results in maintaining that lake at substantially its ordinary maximum stage about twice as large a proportion of the time as Rainy Lake. This reduces the amount of storage capacity ordinarily available on the Lake of the Woods to a very small amount. As a consequence more flood reserve or capacity for temporarily storing flood water above the ordinary maximum stage must be provided. Moreover, the discharge capacity of the Lake of the Woods, even with the outlets enlarged as recommended, is relatively smaller than that of Rainy Lake. Since the flood water can not be discharged as rapidly, and since less capacity for storing flood water *below* the ordinary maximum level is ordinarily available, provision has been made in the commission's recommendations for the storing of more flood water above the ordinary maximum level on the Lake of the Woods than on Rainy Lake. In other words, 1.25 feet of flood reserve has been recommended for the Lake of the Woods against 0.5 foot for Rainy Lake.

Another factor influencing the amount of flood reserve to be provided on any given lake is the relation between the maximum natural rate of inflow and the maximum natural rate of outflow. A relatively small lake usually has a maximum natural rate of outflow equal to its maximum rate of inflow. On such a lake no increase in outflow capacity is required under regulation; neither is a flood reserve required. This is substantially the condition in Lake Namakan for example. On the other hand, a lake whose area is large in comparison with the area of its tributary watershed, other conditions being similar, always has a maximum natural rate of inflow greatly in excess of its maximum natural rate of outflow. On such a lake the outflow capacity must be increased or a large flood reserve must be provided, or both.

The maximum natural rate of inflow into the Lake of the Woods was more than twice the maximum natural rate of outflow. The maximum natural rate of inflow into Rainy Lake was only about 35 per cent greater than the maximum natural rate of outflow, hence

much less flood reserve is required on this lake than on the Lake of the Woods.

Another consideration affecting the amount of flood reserve required for a given margin of safety is the character of the watershed. Here, again, the advantage lies with Rainy Lake. Melting snow and rain drain off from the watershed directly tributary to the Lake of the Woods very much faster than from the upper Rainy watershed. This is well illustrated by the conditions that prevailed during the 1916 flood. The maximum natural rate of inflow into the Lake of the Woods would have occurred during the last 10 days of April when Rainy Lake, under natural conditions, with more than half the tributary watershed, would have contributed less than one-fifth of the total inflow. On the other hand, the maximum natural rate of inflow into Rainy Lake occurred during the last 10 days of May. At the time when, under regulation, Rainy Lake would be discharging its maximum, the flood from the local watershed tributary to the Lake of the Woods would be long past. Under regulation the maximum rates of inflow into the Lake of the Woods will occur long before the maximum regulated outflow from Rainy Lake reaches this lake. Therefore, if storage is provided for these waters, there will be no difficulty experienced in taking care of the regulated outflow from Rainy Lake.

It is apparent from these facts and considerations that a much greater flood reserve, for the same margin of safety, must be provided on the Lake of the Woods than on Rainy Lake, hence the recommendation for 1.25 feet of reserve on the former lake and 0.5 foot on the latter.

XI.—ADMINISTERING PROPOSED REGULATION.

In view of the important international rights and interests involved in the proposed regulation of the waters of the Lake of the Woods watershed the commission has recommended that it be vested with international supervision and control over all dams and regulating works extending across the international boundary, the dam and regulating works across the Canadian channel at Kettle Falls, with the right to control the discharge of water from the Lake of the Woods when the level of the lake exceeds 1,061 or falls below 1,056.

Such supervision appears essential, because the future development of the public and private interests involved in both countries precludes the possibility of recommending an entirely complete and definite method of controlling the level and the flow of the waters under consideration, and because the diverse meteorological and other conditions that will prevail in the future as in the past make it impracticable to specify in advance what shall or shall not be done under any and all of these varied conditions. The maintenance of the recommended level, if it is also to permit of the advantageous use of the available water and at the same time promote the development of the interests involved, necessitates the gradual development of the details of a scientific system of regulation.

The commission appreciates the fact that, in the case of drainage basins that lie wholly within one country or the other, it may be desirable to artificially divert waters out of and from their own local watershed for use in another. On the other hand, diversions from an international watershed, such as that of the Lake of the Woods, whereby the international channel in that watershed would be deprived by such diversion of waters which naturally belong to the Lake of the Woods drainage system, would very probably lead to irritating disputes between the people of two neighboring countries. Further, the existing and future development of the entire waters of the Lake of the Woods watershed will involve very large expenditures, and an investment of such magnitude must naturally depend upon some definite understanding that the flow of water on which it is based will not be diminished by a diversion of any portion thereof from the watershed. For these reasons, the commission has suggested that no diversions, temporary or permanent, out of the Lake of the Woods watershed, of any waters which in their natural

SUBMERGED DOCK, KENORA.

course flow into these boundary waters, should be permitted without first referring the matter to the commission for such recommendation as it may deem appropriate.

The protection of property interests around Rainy Lake and the Lake of the Woods, as well as around the lakes above Kettle Falls, will at times necessitate the wasting of water before the reservoir storage capacity is exhausted. Such wasting of water involves the possibility of loss to water-power interests. Failure to waste water at the proper time involves the possibility of loss to riparian owners. Just when and at what specific rate water shall be wasted can not be stated in advance. Any system of regulation to be efficient must therefore be flexible to the extent at least of giving to those authorized to administer it reasonable discretionary power.

The primary object of the recommended supervision and control would be to protect the interests of riparian owners in both countries during seasons of excessive flood inflow into the reservoirs and to protect the interests of navigation against loss and damage due to excessive draft upon the stored water toward the end of a series of dry years, while at the same time permitting the advantageous use of the waters flowing from the reservoirs for power purposes; leaving to the owners of all dams and other works in these waters the right, subject to the limitations of the proposed international control, to use the same under their respective local governmental jurisdiction for the purposes for which they were intended.

XII.—IMMEDIATE INTERNATIONAL SUPERVISION.

If the foregoing conclusions and recommendations are approved and adopted, the commission can not urge too strongly the immediate enlargement of the outlets of the Lake of the Woods. The work of construction and excavation and the acquisition of the necessary flowage rights, however, will delay for a considerable time placing in full operation the recommended system of regulation. In the meantime the level of the Lake of the Woods can not safely be maintained at 1061.25, sea-level datum, as recommended. During the construction period both judgment and foresight must be exercised to prevent damage to riparian owners, summer resorters, power interests at the outlets, and temporary structures and equipment. Moreover, there should at least be a measure of cooperation between the interests on the upper Rainy watershed and those on the Lake of the Woods while the necessary construction work is being done.

The existing restricted outlets of the Lake of the Woods make it impossible to fix any *range* of levels within which its waters could be controlled entirely by Canadian users, without possibly adversely affecting international interests. The commission therefore feels that, pending the carrying out of its recommendations, it should be authorized to advise the Government of Canada as to any changes in the discharge of waters from the Lake of the Woods that may be immediately necessary in the opinion of the commission in order to protect international rights involved.

As elsewhere stated, the commission considers it should meantime be the aim of those controlling the levels of the Lake of the Woods to maintain an elevation of 1,060.5 under ordinary conditions, conserving the waters in the interest of navigation and power development as far as practicable, while at the same time providing for such storage capacity in the spring of the year as the meteorological data may indicate should be available in order to prevent the level of the lake from exceeding 1,062.5 in the case of recurrence of the most extreme flood inflows that have occurred in the past. It would be the policy of the commission to collect, for the information of interests concerned, all essential meteorological, hydrological, and other data relating to the regimen of the waters of the Lake of the Woods watershed.

Dated at Detroit, Michigan, this 18th day of May, 1917.

OBADIAH GARDNER,
CHARLES A. MAGRATH,
JAMES A. TAWNEY,
HENRY A. POWELL,
ROBERT B. GLENN,
P. B. MIGNAULT.

Although we have signed the foregoing report, we do not wholly assent to the restricted system of supervision and control therein recommended, and we reserve the right to submit supplemental conclusions and recommendations in respect thereto and in respect to other matters which in our judgment should be included therein.

JAMES A. TAWNEY.
OBADIAH GARDNER.
ROBERT B. GLENN.

WHITE DOG RAPIDS.

PART II.

SUPPLEMENTAL CONCLUSIONS AND RECOMMENDATIONS TO FINAL REPORT IN RE LAKE OF THE WOODS REFERENCE.

By Commissioner JAMES A. TAWNEY, concurred in by Commissioners GARDNER and GLENN.

EXPLANATORY STATEMENT.

The international and engineering problems involved in the examination and report upon the questions set forth in the reference are of such magnitude and importance; the national, State, provincial, corporate, and private interests concerned are so vast, varied, and conflicting, it is a matter for congratulation that, as to almost all of these, the commission has been able to unanimously agree.

Although I fully concur in the findings of fact and, with one exception, in the conclusions and recommendations as set forth in the Final Report of the commission, nevertheless I am constrained to avail myself of the privilege afforded me by qualifying my concurrence to the one recommendation therein to which I do not wholly assent, and by submitting for the consideration of the parties certain additional conclusions, recommendations, and discussion which, in my judgment, are appropriate and necessary to a full and complete report upon the reference.

The following is not intended, therefore, as a criticism nor as the basis for criticism. It is submitted from a sense of duty to both Governments and in that same spirit of international good will that has characterized this investigation from the beginning.

First. That the supervision and control recommended on page 37 of the Final Report should not be limited to the boundary waters of this watershed, including the regulating structures at the outlets of the Lake of the Woods, and the prior advisory judgment of the commission in cases where the complete diversion of tributary waters is contemplated on either side. While I believe that only a limited international supervision and control over dams and controlling works is necessary, yet such control should be exercised over *all structures* materially affecting the level or the flow of boundary

waters, and all structures in waters flowing into boundary waters, as well as waters flowing from boundary waters whenever the use of such structures materially affects the level or the flow of boundary waters.

Second. That the last half of question three is not a restatement of the first half and does not refer to physical matters at all, but on the contrary calls for a definite recommendation, indicating by what arrangement between the two Governments or the high contracting parties the recommendations of the commission can be carried into effect, and the rights necessary for that purpose may be lawfully acquired.

Third. I believe, further, that the Report should set forth the reasons for the decision of the commission against the contentions of counsel for both Governments and for private interests in both countries to the effect that the scope of the reference, and the duty of the commission thereunder, is limited by certain implied "restrictions and exceptions."

SUPPLEMENTAL CONCLUSIONS AND RECOMMENDATIONS.

Grounds upon which objections to commission's recommended control are based.

My objection to the supervision and control recommended in the Final Report arises out of the firm belief that it is not sufficiently comprehensive to meet the requirements of the reference, dispose of the questions therein set forth and prevent similar questions from hereafter arising. It is limited exclusively to dams and regulating works "extending across the international boundary, including the dam and regulating works in the Canadian channel at Kettle Falls and the dams and regulating works in the outlets of the Lake of the Woods."

The reference does not limit the requested examination and report or the recomendations of the commission to the use of the waters of the Lake of the Woods and the water *flowing from* that lake; it also requests consideration of the most advantageous use of the waters *flowing into* that lake. This fact is recognized by the commission on page 2 of the Final Report, where, in interpreting the scope of the reference, the commission says:

> In the judgment of the commission the reference calls for a report upon all matters pertaining to the regulation of the levels of the Lake of the Woods and the advantageous use of its waters, shores, and harbors and the *use of the waters flowing into* and from the lake, and the effect of such regulation on all public and private interests involved.

That the commission is to examine and report upon the advantageous use of the waters of this entire watershed, including those that are directly or indirectly tributary to the Lake of the Woods,

is further sustained by the language of question 3 of the reference wherein the two Governments ask:

> In what way or manner, including the construction and operation of dams and other works at the outlets and inlets of the lake, *or in the waters which are directly or indirectly tributary to the lake*, or otherwise, is it possible and advisable to regulate the volume, use, and outflow of the waters of the lake, etc.

No one has claimed that the two Governments in submitting the reference did not realize what the provisions of the treaty of January 11, 1909, were in respect to the exclusive control reserved by each Government over the tributary waters within its territorial jurisdiction. It appears from diplomatic correspondence respecting the "Birch Lake diversion," preceding, by less than a year, the submission of the present reference, that the exclusive control of these tributary waters was the subject of special diplomatic consideration. The Acting Secretary of State at Washington, in a letter dated August 22, 1911, replying to the British ambassador, concerning the proposed diversion of Birch Lake, calls attention to the fact that:

> The rights of the interested parties in such case (diversion of waters of Birch Lake wholly within the United States) are conclusively established under Article II of the treaty, and an attempt by the commission to interfere with such rights would necessarily be ineffective.

Proceeding, the Secretary says:

> Under Article IX of the treaty, however, jurisdiction is conferred on the commission to examine and report, at the request of either party, upon all questions not otherwise dealt with in the treaty, which involve the rights, obligations, and interests of either party in relation to the other, or to the inhabitants of the other along their common frontier, and it would be agreeable to this Government to take up with the Canadian Government the question of requiring the commission to examine into and report upon a *general plan for the improvement of navigation and power interests of all the boundary waters to which the waters referred to in this note are tributary.*

When this language is read in connection with the language above quoted of question three of the reference with respect to "dams or other works at the outlets and inlets of the lake or in the waters which are directly or indirectly tributary to the lake," it is clear that the scope of the reference, notwithstanding Article II of the treaty, is as interpreted by the commission itself and includes the waters of the entire watershed.

Since in determining how the most advantageous use of the waters of the Lake of the Woods and the waters flowing into and from that lake can be secured, consideration must be given to all tributary waters, a recommendation limiting international supervision to boundary waters and waters flowing from boundary waters can not

be justified unless it can be shown that no regulation *of the inflow into boundary waters* is necessary or desirable, or otherwise that the interests using boundary waters are sufficiently protected against any possible injury from the use of or interference with tributary waters. This is not shown, nor can it be.

Storage in tributary lakes in dry years as serious as total diversion from watershed.

Interference with the natural flow of tributary waters may be fraught with as serious consequence to the interests using boundary waters as the total diversion of tributary waters, depending largely upon the magnitude of the streams whose flow is under consideration and the uses to which the boundary waters are being put. In the Lake of the Woods watershed, above Rainy Lake, there are a number of large tributary lakes. On several of these lakes more than an entire normal year's run-off from the tributary watershed can be stored. The less the annual run-off, and consequently the greater the demand for water in all reservoirs below where regulation to increase the utilizable flow, as against the dependable flow, is in effect, the greater becomes the relative storage capacity of these tributary lakes. The storage of water in these large tributary lakes on either side of the boundary during dry years will result in as complete an abstraction, in so far as the advantageous use of the water is concerned. To illustrate, the regulation recommended for the Lake of the Woods aims to increase the dependable outflow. Under this method of regulation all water over and above the average supply of the most extreme period of dry years occurring perhaps once in intervals of 25 years is wasted. In other words, water stored to increase the dependable outflow from the Lake of the Woods will, on an average, be used only once in about 25 years. The remainder of the time the water is held in the reservoirs pending this emergency. Regulation on Rainy Lake, on the other hand, has as its object the greatest possible increase in utilizable flow. Under this method of regulation the present storage capacity of 100 billion cubic feet is fully utilized every few years. The impounding of water in tributary lakes in the upper Rainy watershed for the purpose of increasing the dependable outflow from the Lake of the Woods, for example, would result in as completely abstracting these waters from the Rainy Lake supply during *ordinary low-water* years as would their total diversion. Moreover, during high-water years these reservoired lakes, being full, would discharge their flood waters as rapidly as they flow in. This would result in increased flood discharges from these lakes. In this way the flood inflow into the reservoirs below would be increased over what they were in a state of nature, and consequently the effective storage capacity of these reservoirs would be reduced. Similarly, any storing of water *during the winter months* and the discharge

of such waters during the log-sluicing season of early summer results in reducing the low-water flow and increasing the flood flow from all lakes so used. It would appear entirely reasonable to limit the storing of inflow into reservoirs to the period during the spring break-up when there is an excessive supply or at other times when the water supply is ample. In view of the development of the Lake of the Woods and the Rainy Lake reservoirs at relatively large cost, as well stated in the Final Report, it would appear unwise to permit either such diversion or such use or interference with the natural flow of tributary waters as would materially lessen the value of these reservoirs for which they were created.

Although it may be urged that interests in one country injured by the use, diversion, or interference with the natural flow of tributary waters on the other side of the line, may, under Article II, seek redress in the courts of the country in which such use, diversion, or interference occurs, nevertheless it would seem far more conducive to the harmonious use and development of the resources of this region, and to the promotion of friendly relations between the people of the two countries, to have the extent of such possible injury determined in advance by an international tribunal than to rely upon later awards for damage by the courts of one nation or the other.

Free and unrestricted use of tributary waters will sooner or later give rise to questions of difference between the two Governments or the inhabitants of the two countries. Moreover, it would seem pertinent to ask why international supervision should be exercised over *boundary waters* so as to permit of the most advantageous use of the waters *flowing from* boundary waters and no supervision be exercised over waters *flowing into* boundary waters so as to permit of the most advantageous use of *boundary waters.* I believe international supervision should be exercised over *all the waters* of this watershed so as to permit of their most advantageous use, *considered as a whole.*

Reference contemplates waiver of Article II of treaty as it applies to these waters.

If the supervision and control, recommended in the Final Report, is limited to boundary waters because no control of tributary waters is authorized under the treaty, or if it is claimed that any system of control that would include waters directly or indirectly tributary to boundary waters would contravene the provisions of Article II of the treaty, and that therefore the commission could not recommend supervision over tributary waters, then I respectfully suggest that this is not a question for the commission to decide.

If the parties to the reference intended that in its examination of the questions submitted to it the commission should not consider waters tributary to these boundary waters, they would have excepted

such waters from consideration, as provided in Article IX of the treaty.

The scope of the recommendations which the two Governments desire the commission to make can not be ascertained from the treaty. It can only be ascertained from the reference, and from this it appears that the two Governments desire to know whether the proper regulation of the level of the Lake of the Woods and the most advantageous use of the inflow and the outflow can, among other ways, be best secured through the construction and operation of dams and regulating works in the waters which are directly or indirectly tributary to that lake. Since, through the treaty, both Governments have expressly reserved to themselves exclusive jurisdiction over tributary waters, they must, in using the above language, deliberately have waived the provisions of Article II of the treaty *in so far as it applies to the tributary waters of this region.*

If the system of supervision and control which will best serve to secure the advantageous use of the waters of this watershed, to maintain the recommended level on the Lake of the Woods and best provide for the harmonious development and the protection of all interests involved, and which will best serve to promote friendly relations between the two Governments and the inhabitants of the two countries, can not be placed in operation under the provisions of the existing treaty, the high contracting parties may, by a joint declaration, provide that Article II "stand in abeyance"[1] in so far as the same applies to the waters of this region; or they may make a new convention for the purpose of putting into force and effect the system recommended, notwithstanding this article.

That the most advantageous use of the waters of the Lake of the Woods and of both the waters flowing into and those flowing from the lake is made the basis for consideration in this investigation, and, as previously stated, is so recognized by the commission in its Final Report, yet the recommendations are not entirely consistent in this regard. Even as they stand these recommendations are not wholly within the provisions of the treaty. For example, the level recommended for the Lake of the Woods reduces the amount of potential water power in the United States at the Long Sault Rapids on the Rainy River by about 1,000 horsepower below what would be available if the level which would best serve all the interests on the United States side were recommended and which would give the United States full enjoyment of the one-half of the available boundary water supply to which, under Article VIII of the treaty, it is entitled. However, this commission is unanimously of the opinion, as stated on page 26 of the Final Report, *that with proper compen-*

[1] This is quite common. It was done by Great Britain and France in respect to Egypt and Morocco in their declaration of Apr. 8, 1904.

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sation to all property and interests injuriously affected the recommended level will permit of the most advantageous use of these waters. In other words, the basis for the recommendation is *the advantageous use of the waters under consideration* without reference to treaty provisions.

By providing storage on upper watershed loss to United States interests because of Lake of the Woods levels could be compensated for.

It does not appear reasonable to adhere to the provisions of the treaty if by deviation from those provisions the beneficial use of these waters as a whole may be greatly increased. There would seem to be no good reason why one nation should not accept compensation for a right possessed under the treaty which, if relinquished in a specific instance, would permit its neighbor to enjoy benefits otherwise lost to both nations aggregating many times the value of that which has been relinquished. When it is impracticable to give money compensation it may be possible to give compensation in kind. For example, Canada might provide reservoir storage on the upper Rainy watershed and thus supply an amount of water whose power was equivalent to that lost by the United States as the result of the maintenance of a level on the Lake of the Woods, which reduces the available power at the Long Sault Rapids.

It has likewise been pointed out in the Final Report that the most advantageous use of the waters of the Upper Rainy watershed for power purposes on that watershed and on the Winnipeg River, considered as a whole, could be secured by limiting the rate of discharge from Rainy Lake whenever stored water is being drawn upon to a rate of about 8,000 c. f. s., but that such regulation would reduce the available water power at International Falls and Fort Frances by substantially 1,000 horsepower, or one-twentieth of the total power available at that site. Such regulation, while resulting in a loss of about 500 horsepower to the United States, would increase the potential water power on the Winnipeg River in Canada by about 25,000 horsepower. For some years to come Canada will not require this additional power, but when that time comes the situation can be met if Canada will provide reservoir storage on tributary lakes within her borders, and in this way supply an amount of water capable of developing power equivalent to that which the United States would lose under the modified regulation of the outflow from Rainy Lake. Evidently, since such storage would be created for the purpose of reimbursing the United States, international supervision over the regulating works controlling this storage would be essential if the intended reimbursement is in fact to be realized.

Without a comprehensive plan of international supervision over all the waters of the watershed, international questions or matters

of difference will not be prevented from arising hereafter, especially when, as at the present time, power and commercial development in the Lake of the Woods region is a matter of such tremendous importance to the people of both countries. Without international supervision the difficulties which have attended every development yet completed or projected on this watershed will not be removed.

All rights in use of these waters should be subordinated to international rights, interests, and obligations.

At present it is the undoubted right of both Governments within their respective jurisdictions and subject to the provisions of the treaty under which this reference is submitted to use these boundary waters, including waters flowing therefrom and their tributary waters, for any purpose and in their own interest or for the benefit of their respective peoples. This use also involves State, provincial, corporate, and private rights; these latter rights, except commercially, are, however, on account of possible international differences arising out of their exercise, subordinate in rank and importance to the international rights involved.

Hence, the regulation of the level and flow of these waters, together with the supervision and control over all dams and regulating works therein, should, as far as practicable, be removed from private, local governmental, and even national interest and influence, not only for the purpose of securing their most advantageous use in both countries, considered as a whole, and the protection and development of all interests involved, but also, and what is far more important, for the purpose of preventing disputes between the two Governments or the inhabitants of the two countries hereafter from arising on account of such use.

For these purposes, regulation, supervision, and control need not be exclusively international. Its primary object would be to protect navigation interests of both countries in these lakes and rivers in both high and low water periods; to protect the rights of riparian owners during seasons of excessive inflow into the reservoirs, while at the same time permitting the most advantageous use of the waters for power purposes, leaving to the owners of all dams and regulating works therein the right, subject to the limitation of such international control, to use the same under their respective local governmental jurisdiction for the purposes for which they were built and are maintained.

I maintain, therefore, from the standpoint of the scope of the reference, from the standpoint of securing the most advantageous use of the waters of this entire watershed, and also from the standpoint of a sound, comprehensive international policy, that what is necessary and what the two Governments desire is, that the advisory judgment of the International Joint Commission shall be sufficiently

broad and comprehensive to cover the control of all the waters out of which previous and pending questions of difference arose, or out of which similar questions may hereafter arise.

In view of this I respectfully recommend that, subject to the limitations already set forth in the Final Report, the International Joint Commission be authorized to exercise supervision and control over the operation of all dams and regulating works already constructed or which will hereafter be constructed, whether in boundary waters or in waters flowing therefrom or in tributary waters but which will materially affect the level or the flow of the boundary waters of the Lake of the Woods watershed.

Supervision and control over existing and all future dams or other works in waters of entire watershed.

And further, that, as a matter of sound international policy, neither Government should permit any use or diversion or interference with the natural flow of any waters within its jurisdiction which are tributary to the boundary waters under consideration, and which would result in any injury on the other side of the boundary, without the approval of the International Joint Commission, and that the decision of the commission in all such cases be made final. As a condition of its approval said commission should require that suitable and adequate provision, approved by it, be made for the protection and indemnity of all interests on both sides of the line which may be injured as the result of such use, diversion, or interference with the natural flow of waters tributary to the boundary waters under consideration.

If international supervision over the entire watershed is adopted, with a view of securing the most advantageous use of its waters, considered as a whole, and after the demand for water power on the Winnipeg River makes it desirable to further increase the dependable outflow from the Lake of the Woods over and above that contemplated in the recommendations of the commission, said international control over the regulating works at the outlets of Rainy Lake and Lake Namakan may be exercised with a view of limiting the rate of discharging waters, whenever necessary, to such a rate as will assure that Rainy Lake and the lakes above Kettle Falls will be full at the beginning of a dry period of years by the time it becomes necessary to draw on the stored water on the Lake of the Woods. Such modifications in the method of regulating the outflow from Rainy Lake in the interest of power development on the Winnipeg River shall not be adopted, however, until Canadian interests shall first have provided additional storage on the Canadian side of the Upper Rainy watershed to compensate for the loss of power which such change in the method of regulating the outflow from Rainy Lake will entail upon the power interests on the United States side of the Rainy River.

MEANS OR ARRANGEMENT FOR MAKING RECOMMENDATION EFFECTIVE.

Answer to question 3 in final report incomplete.

As I interpret the last half of question three, it calls for a specific recommendation. On the other hand, the commission has not so interpreted it, and in consequence the Final Report contains no recommendation on the subject of the "means or arrangement" necessary to the proper construction and operation of regulating works or as to how best to secure and maintain a system or method of regulation. As I construe it, question three involves not one but two separate and distinct recommendations:

First. "In what way or manner, including the construction and operation of dams and other works at the outlets and inlets of the lake," or in its tributary waters, "or otherwise, is it possible and advisable * * * to maintain the level recommended in answer to question one." * * *

Second. "By what means or arrangement can the proper construction and operation of regulating works, or a system or method of regulation be best secured," etc.

There is a wide distinction between the physical character of the dams and other works by which it is possible and advisable to regulate and maintain the recommended level and the "means or arrangement" by which these regulating works can be properly constructed, operated, and maintained, or a method of regulation be best secured. Both are equally essential. Without the physical structures or the right to exercise a limited control over existing structures there could be no regulation. It is equally true that without some arrangement between the parties for the acquisition of the necessary right to construct these works or the right to a limited control in the operation of existing structures, and the right to submerge riparian lands in consequence thereof, the physical means necessary for such control and regulation could not be secured, operated, or maintained. Without either or both, none of the recommendations under the reference could be made effective and the questions of difference between the parties would remain unsettled.

The words "the proper construction of regulating works" does not call for a recommendation as to a plan with specifications for the construction and operation of these works. This would be an engineering detail entirely foreign to the subject matter of the reference. On the other hand, where, as in this case, the right does not exist, proper construction involves the acquisition of the right to construct, operate, and maintain, together with the right to overflow riparian lands. Neither Government possessing these rights and having no authority to acquire the same, either jointly or severally for the benefit of the other, within their respective jurisdictions,

FRONT STREET, FORT FRANCES.

they have, as I claim, very naturally asked this commission to make an appropriate recommendation in the premises.

The particular thing required for the accomplishment of a certain purpose is an altogether different proposition from the "means or arrangement" by which the thing thus required can be properly obtained. They involve altogether different considerations. Hence, as I construe it, the last part of question three means: How can the necessary rights for the proper construction, maintenance, and operation of the controlling works, recommended in answer to the first part of question three, or a system of regulation, etc., "be best secured and maintained?"

The construction, operation, and maintenance of the necessary controlling works, or the recommended system of regulation, including supervision and control, involves the rights and interests of both Governments and of the inhabitants of both countries.

Rights necessary to secure and maintain recommended regulation.

The questions set forth in the reference have arisen out of the independent use, for about 30 years, of a common natural resource, viz, boundary waters. During this period such use gave rise to serious differences between the people of the two countries, and was also the subject of diplomatic correspondence between the Governments. The maintenance of the level now recommended for the Lake of the Woods, not only in the interest of navigation in both countries, but of power development in Canada, necessitates the acquisition of flowage and other rights, because only in this way can the most advantageous use of these waters be rightfully and permanently secured. Regulation in the interest of navigation alone does not necessitate the acquisition of flowage above elevation 1,062 sea-level datum, but this interest requires a minimum stage above 1,056. The Winnipeg River water-power interests require a certain range in levels over a long period of years in order to secure a satisfactory uniform rate of outflow from the lake. If it were not necessary to keep the low-water stage above 1,056 during the navigation season, however, the range required by the power interests could be secured below ordinary high-water mark in a state of nature. In other words, neither the water-power interests *alone*, nor the navigation interests *alone*, require flowage above elevation 1,062, but *both* interests using the waters of the Lake of the Woods *simultaneously* do require flowage above that elevation.

In addition to securing these flowage rights, it will be necessary also to acquire the right to enlarge outlets, to construct and maintain dams or other controlling works, and to acquire the right to control, in part at least, for the purposes above set forth, existing dams and controlling works in these boundary waters and in waters flowing into and from them.

Any arrangement for the acquisition of these necessary rights involves the taking of private property within the jurisdiction of both Governments.

Arrangement for acquiring necessary rights of flowage, etc.

If the recommendations are approved, they can be made effective only by a special agreement between the high contracting parties under Articles III and IV of the treaty of January 11, 1909, or by virtue of a new treaty. In my judgment, the above treaty clearly authorizes such an agreement, and in it the "means or arrangement" referred to in question 3, by which the acquisition of all necessary rights may be provided for. These necessary rights can not be acquired, however, in either country except in accordance with the principle of due process of law and just compensation. The procedure for their acquisition must, therefore, and in any event, satisfy all the legal requirements of both countries in respect thereto. This plan of procedure, then, should in the main include:

First. A declaration by the high contracting parties setting forth the purposes for which the taking of property is necessary. This should be stated to be, primarily, to settle the pending questions of difference set forth in the reference and to prevent similar questions from hereafter arising between the parties along this part of their common frontier on account of the independent use of these boundary waters, and by providing for their most advantageous use hereafter in both countries, as recommended by the commission. This would constitute a public use and authorize the taking of property for this use under the power of eminent domain and expropriation.

This declaration should also set forth how the use of the property to be taken will accomplish the declared purpose of its taking. It should likewise contain a general description of the property to be taken, including a description and the location of such necessary structures, excavation, etc., in the outlets and inlets of the lake and in its tributary waters, and the nature and extent of any rights required for the operation and control of any existing structures deemed necessary in connection therewith.

Second. It should also authorize the appointment of a special commission, consisting of two, one from each country, or authorize and direct the International Joint Commission, in the name of the United States and the Dominion of Canada, to acquire the property described by purchase or to proceed for that purpose by public hearings, upon due notice to all parties in interest, of the time and place of each hearing, and ascertain from competent evidence the ownership and reasonable value of the land to be taken, destroyed, or damaged, as follows: Along the shores of the Lake of the Woods between the meandered shore line and contour 1064. And, when directed so to do, along the shores of Rainy Lake between ordinary

high-water mark under natural conditions and contour 501, public works datum. Along the shores of Lake Namakan between ordinary high water under natural conditions and contour 516, public works datum.

And in the same manner ascertain in each separate case the ownership and reasonable value of any existing structures in the outlets and inlets of the Lake of the Woods or in the outlets and inlets of any of its tributary waters, the taking of which is deemed necessary for such proposed use, and the reasonable value of the right to control and regulate, in common with the owner, the operation of any existing physical structures in said outlets and inlets, whether publicly or privately owned, where it appears from said declaration to be necessary to acquire such right of limited control.

And in the same manner ascertain the ownership and reasonable value of any and all other property taken, destroyed, or damaged for the purpose of such public use, such as lands, buildings, etc., used in connection with fisheries on said lakes, camp sites, docks, wharves, boathouses, and other property owned and used in connection with the ownership and occupancy of any island in said lakes for residence or for other purposes.

And in the same manner to ascertain in each case the damage, if any, sustained by any organized or unorganized municipality or village on account of the levels of the Lake of the Woods and Rainy Lake being maintained as recommended, including also any injurious effect on that account upon the sewerage and drainage system in use therein.

In case it is agreed that the International Joint Commission shall proceed as hereinbefore set forth, said commission should be authorized to appoint a committee or committees of its own members to hear and report to it the evidence taken and to issue commissions to take and return testimony for the purposes herein stated.

At the conclusion of said hearings, and after careful consideration of all evidence, said commission should make and sign its award in each separate case as to the ownership and the amount of damage awarded to the owners of or other parties legally interested in the land so taken. Also in all cases where the value of dams or other controlling works are involved, or where only the right of a limited control is acquired for the purpose of accomplishing and maintaining the recommended system of supervision and control. It should also be directed to proceed in like manner and make and sign its award in all other cases involving damage to property other than that above mentioned but described in said declaration.

In case said commission (if it is a special commission created for this purpose) should be unable to agree upon its award in any case, the members thereof should be authorized to select a third member

from either country, whose duty it shall be to carefully consider all the evidence in such case and then join with one or the other of said commissioners and with him make and sign its award in said case, which award shall be taken as the final award of said commission in that particular case.

In case any owner of, or other party legally interested in, land lying along the shores of any of the waters herein mentioned waives his or its right to compensation for any land taken, destroyed, or damaged, such waiver shall be in writing, duly signed and acknowledged by the maker, and said commission should be authorized to receive and accept the same as the basis of its award in that case.

Third. Said award, when made and signed, should then be reported to and filed in the Federal courts of both countries within whose jurisdiction the land or other property described therein is situated, and at the same time said commission should also file in said court, with its awards, copies of all notices, and on whom served, of the times and places of such hearings, etc.; also maps, if any, showing the location of said lands or other property, and also the evidence taken in each case upon which said awards are based.

Fourth. The filing of said report and awards should be taken and deemed to be the commencement of an action therein for the purposes set forth in said special agreement. Thereafter, and upon the application of either Government, the court shall make and enter its order directing that the applicant or applicants for such order shall cause notices to be served upon or given to, at their own cost and expense, the owner of land or other property described in each of said awards, and upon any party who it appears therefrom is legally interested therein. Said notices should be to the effect that the report and awards of said commission have been duly filed, the amount thereof, and that if the owner of said land or other property is, for any reason, unwilling to accept the same, he may, within 60 days from the date of the service of said notice, appeal, specifying fully his ground of appeal. Either Government may also and in like manner appeal. Such appeal may be noticed for trial, as in the case of other civil actions in said court, and all proceedings thereafter had thereon shall conform to the rules governing the trial of similar cases in said courts.

At the conclusion of the trial of all such appeals, judgment shall be entered upon the verdict or decision fixing the amount of damages payable to the several parties concerned and prescribing the terms and conditions of the taking. Upon payment of said damages, cost and interest, if any, the Governments, or either of them, shall be permitted to take possession of said lands or other property and appropriate the same to the public use for which it has been taken,

subject to the provisions of such judgment; and, until reversed or modified in a direct proceeding begun for that purpose, said judgment shall be binding upon all parties thereto and upon their respective successors and assigns.

In all cases where no appeal is taken from the awards of said commission within the time fixed by said notice, the judgment of the court shall likewise be entered and have the same force and effect as in cases where verdicts or decisions on appeals have been rendered, provided that, where judgment is entered upon the award without appeal, it shall be for an amount equal to 10 per cent in excess of the amount of the award, and all awards shall bear interest at the rate of 6 per cent per annum from the date of their being filed in said court.

Fifth. It should also be provided that either of the Provinces, or the State of Minnesota, or any person or corporation in either country interested in the ultimate use of said waters, shall be permitted to appear at said hearings and present in its or their own behalf any material evidence relating to the subject matter of the hearings.

Sixth. As to lands or other property in Minnesota all awards not appealed from, and all awards confirmed by the court should, in the first instance, be made a charge upon the United States. As to lands or other property in one or more of the Provinces, all awards not appealed from, as well as those confirmed by the court, should, in the first instance, be made a charge upon the Dominion of Canada.

Seventh. The commission should be authorized to apportion the total cost of acquiring the property, flowage, and all other rights necessary to the proper construction or control of all dams and other regulating works, or to the maintenance of the system of regulation, supervision, and control, recommended either in the Final Report, or herein, between the United States and the Dominion of Canada, on the basis of the benefits secured by each, or upon such other basis as may appear to the commission just and equitable. The decision of the commission in this respect should be made final. If it should happen, however, that either country was liable under such apportionment for a sum greater than the amount adjudged and charged against it in the first instance under the sixth paragraph herein, the amount of such excess should be stated and reported to both Governments as the finding of the commission, and made a final charge against that Government in addition to the amount charged against it in the first instance, and such excess should then be paid by said Government to the Government against whom it was originally charged.

DISCUSSION OF RECOMMENDATION FOR ACQUIRING NECESSARY RIGHTS.

The foregoing recommendation involves principles of international and national importance; principles which are fundamental and well established, but which have perhaps never before been applied to the settlement of an international dispute. This fact, however, does not prove that their application, in this case, is either impracticable or unsound.

Each Government must obtain within the jurisdiction of the other certain property rights.

To secure the proper construction and operation of the controlling works in the outlets and inlets of the Lake of the Woods and in the waters tributary thereto, or a system or method of regulation that will insure "the most advantageous use of the waters of the Lake of the Woods and the waters flowing into and from that lake," for the purposes stated in the reference, and a settlement of the questions and matters of difference between the parties to the reference, each Government must obtain, within the jurisdiction of the other, certain property rights. This fact should be kept constantly in mind when considering the foregoing recommendation. Whether these rights should be vested rights, acquired jointly by the two Governments for their common use and benefit, or acquired severally within the jurisdiction of each and then held in trust for the benefit of the other, seem too clear to admit of discussion.

Rights acquired should be vested rights.

The interdependent interests, the importance and value to both countries and their people of permanently securing all the material advantages from the use of these waters and preventing such use from hereafter being a disturbing factor between the two Governments, are of such magnitude that the rights acquired in respect thereto should be permanent and irrevocable. If acquired severally and thereafter held by the Government acquiring the same in trust for the benefit of the other the uncertainty of tenure would seriously impair the stability of these rights and probably constitute a barrier in the way of the development of the water powers of this region, because rights thus held could be renounced at will.

It therefore becomes necessary to consider the question of how the parties to the reference can legally acquire and hold, under the jurisdiction of the other, these necessary vested rights in order to insure the satisfactory maximum water-power development in both countries this region affords, and at the same time safeguard the rights and promote the development of the interests of their respective peoples. The first question to be considered in this connection is: Can a State in its public capacity hold nonterritorial property in another State or can a sovereign State limit or qualify its proprietary sovereignty by permitting another State

Can one State acquire and hold property in another for a use to be enjoyed in its jurisdiction?

LITTLE GRASSY RIVER.

to acquire and hold property within its territorial jurisdiction for the use and benefit of such other State within its jurisdiction or for the use and benefit of its inhabitants? In discussing this question Taylor, International Public Law, page 263, says:

> A State may limit or qualify its sovereignty and jurisdiction over its territorial property by permitting a foreign State to perform within its boundaries certain acts otherwise prohibited, or by surrendering the right to exercise certain parts of its domestic jurisdiction as a protection to others.

The doctrine here laid down is supported by all text writers on international law. It is also affirmed by the Supreme Court of the United States in many cases. In the case of the "Exchange" (7 Cranch., 135) Chief Justice Marshall, delivering the opinion of the court, says:

> The jurisdiction of the Nation within its own territory is necessarily exclusive and absolute. It is susceptible of no limitations not imposed by itself. Any restrictions upon it deriving validity from an external source would imply a diminution of its sovereignty to the extent of its restriction, and an investment of that sovereignty, to the same extent in that power, which could impose that restriction. All exceptions, therefore, to the full and complete power of a nation within its own territory must be traced to the consent of the nation itself. They could flow from no other legitimate source.

The power of a nation to restrict its proprietary sovereignty by granting to another nation the right to acquire and hold title to land or vested rights or easements therein the same as if held by a private individual can not be questioned. Lands, rights, or easements thus acquired are held, however, subject to the political sovereignty of the nation granting the right to hold the same.[1] It is true that in this case the discussion was confined to the relationship between the United States and a State under such circumstances, but the difference presents only a question of policy and not of power. This doctrine has also been universally recognized and followed by nations "time out of mind," as appears from their treaties. The granting of this right, however, does not involve or carry with it any surrender of political sovereignty. That remains unchanged and supreme.

Great Britain, in the treaty of 1783 with the United States, agreed to restrict her proprietary right over certain fishing grounds by granting to United States fishermen the right to fish in certain waters within her territorial jurisdiction in North America, and also to land their boats on her territory for the purpose of drying their nets and curing fish. After the War of 1812 these rights were recognized as valid and were reaffirmed by the treaty of 1818.

While the right of one nation to qualify its jurisdiction over its own territorial property by permitting a foreign nation or the people

[1] Leavenworth Railroad Company *v.* Howe (114 U. S., 525, 538).

of another country to perform certain acts, or acquire and hold property which otherwise would be prohibited, can not be successfully questioned, yet this applies in this case only in so far as it would enable the United States or the Dominion of Canada to hold within the jurisdiction of the other the rights necessary to make the recommendations of the commission effective.

The rights, however, which both parties must have for this purpose are not rights which either now possess. They are rights which belong to their respective inhabitants and, if not voluntarily granted, can be acquired only for the purposes desired, by and through the exercise of the sovereign power to take private property for a public use. Can this power, by agreement, be exercised jointly by the high contracting parties for this purpose?

I fully realize that to propose, for the purpose of settling an international dispute, to authorize one Government to take private property within the jurisdiction of another for a use to be enjoyed by that Government within its own jurisdiction, or for a use to be enjoyed by its citizens or subjects, outside of the jurisdiction of the Government in which the property is situated, is essentially new. Yet, as I have said before, that is what must be done in this case if the questions and matters of difference set forth in this reference are to be satisfactorily disposed of and the control and regulation of these waters, in the interest of both, is to be secured and permanently maintained. This serves to emphasize the necessity for a recommendation in the premises and the consideration of the questions it involves.

Procedure must conform to fundamental law of both countries.

While the right to take private property for a public use is a sovereign right, and the procedure for its exercise may differ somewhat in the respective jurisdictions of the two countries, yet in either jurisdiction the procedure must conform to the fundamental law of each. Under either or both the rights of the citizen or the subject with respect to the taking of his property for a public use are substantially the same. They emanate from the same common source and both are protected in their enjoyment under the same or similar rules of law. In the United States, under a written Constitution, these rules are perhaps more rigid, or less flexible, than in the Dominion of Canada. Therefore, if the recommendation for this purpose meets the requirements of the Constitution and laws of that country, it will not likely be found inconsistent with the laws governing the taking of private property in the Dominion of Canada. In neither country, however, can such property be taken for any purpose without compensation and in accordance with the principle of due process of law.

It being conceded that the questions or matters of difference between the Governments in this case have arisen out of the independent use of these boundary waters, which are the common property of both, and that some arrangement between them for the acquisition of certain rights within the jurisdiction of each is necessary in order to satisfactorily adjust the same, and thereafter avoid similar questions from arising from the same cause, and that this necessarily involves the taking of private property, it follows that, if the purpose for which the property is to be taken is such as would authorize its taking within the jurisdiction in which it is situated, then by agreement such property may be taken for that purpose upon the joint action of both Governments for their mutual benefit, and thereafter held in common, provided such agreement is authorized by law. The high contracting parties each possess and may exercise the power of eminent domain or expropriation in their respective jurisdictions, for their own or the public good. It follows, therefore, that in their sovereign capacity, they may by treaty agree to do jointly and for their mutual welfare, in their respective jurisdictions, that which they are authorized to do severally. This principle is recognized by the treaty under which the two Governments submit this reference. They have clothed this commission with final jurisdiction in both countries in certain matters which involve the rights, obligations, or interests of either in relation to the other, or to the inhabitants of the other. They may, therefore, *conclude a treaty* providing for the institution of legal proceedings in either or both countries for the taking of private property, provided (in the United States) the purpose of the proposed taking is a public use. That being so it is clearly within the power of the high contracting parties to authorize, by treaty, the making of a special administrative agreement between them for the complete accomplishment of the purposes of that treaty or of any part thereof. This I respectfully submit is exactly what Great Britain and the United States have done in their so-called waterways treaty of January 11, 1909.

Parties may agree to do jointly that which they may do severally.

Counsel for some of the power interests, however, argue that to carry out the recommendations of this commission and secure the right to do that which is necessary for that purpose, a new treaty, or reciprocal legislation between the United States and Canada, is necessary.

In that case all the advantages and benefits to be derived from a prompt and final settlement of the questions and matters of difference set forth in the reference would necessarily be postponed for an indefinite period, pending the making and ratification of a new treaty.

In my judgment this is unnecessary. The questions here involved are expressly covered by the above treaty, and their settlement by special agreement between the high contracting parties is authorized and may be accomplished upon such terms and conditions as they may agree, without further treaty stipulations.

Purposes of existing treaty.

One of the main purposes of this treaty was to settle and also prevent disputes between the United States and the Dominion of Canada, by providing, among other things, for the satisfactory use of these boundary waters. Accordingly they created this commission, clothing it with final jurisdiction in the matter of approving all subsequently authorized uses, obstructions or diversions on either side of the boundary that affect the level of boundary waters, except uses, obstructions, or diversions heretofore permitted, "*or hereafter provided for by* special agreement between the high contracting parties."[1]

Article IV of the treaty provides:

> The High Contracting Parties agree that, except in cases provided for by *special agreement between them*, they will not permit the *construction or maintenance* on their respective sides of the boundary of any remedial or protective works or any dams or other obstructions in waters flowing from boundary waters, etc.

By the terms of the foregoing articles, the high contracting parties have expressly provided for the exercise of their undoubted right to thereafter, not by treaty, but by special agreements between them, provide for certain specific things in respect to the use, etc., of these boundary waters. Such agreements are merely administrative and are intended only to aid in the full accomplishment of the purposes for which the treaty was concluded.

Power of President respecting agreements with foreign nations.

Who on behalf of the United States is authorized to make such an agreement, and would the advice and consent of the Senate be required to give it validity?

It may be unnecessary for the information of the parties to the reference to answer these questions, but so much doubt, concerning them, has been expressed by eminent counsel, representing other interests involved, and by others, that their consideration in this connection becomes important.

To the President is intrusted the exclusive power of communication with foreign States. "The President is the sole organ of the Nation in its external relations and its sole representative with foreign nations."[2]

Accordingly, with him resides the right of determining finally by whom negotiations are to be conducted with foreign powers. Although such negotiations are regularly conducted through the

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[1] Article III of the treaty of Jan. 11, 1909.

[2] John Marshall in the House of Representatives, Mar. 7, 1800, Annals Sixth Congress, 613.

Secretary of State, they originate in legal contemplation with the President.[1]

Without treaty or legislative authority, an agreement terminable on six months' notice was reached with Great Britain April 28–29, 1817, between Mr. Bagot, British minister, and Mr. Rush, Acting Secretary of State, for the limitation of naval forces to be maintained between the two Governments on the Great Lakes. Nearly one year later, April 6, 1818, President Monroe submitted the correspondence to the Senate for its consideration, whether it was such an agreement as the Executive was competent to enter into under the power vested in him by the Constitution, or such as required the advice and consent of the Senate. By resolution, April 6 (two-thirds of the Senators present concurring), the Senate approved and consented to the agreement and recommended that it be carried into effect by the President. There was no formal exchange of ratifications but the agreement was proclaimed by the President April 28, 1818.[2]

An act of Congress approved February 27, 1815, had authorized the President to cause all armed vessels on the lake, except such as in his opinion were necessary for the execution of the revenue laws, to be dismantled, sold, or laid up. Immediately upon the exchange of notes and prior to any action thereon by the Senate, the President had proceeded to give effect to the arrangement, and in his annual message to the Senate December 7, 1817, he referred to the arrangement as having been concluded. Its submission to the Senate appears to have been an afterthought and as an act of prudence. This wise and beneficial arrangement has in its general principle now continued in force for a century.[3]

Another important agreement of this character entered into by the President without the advice and consent of the Senate was the protocol of August 12, 1898, which constituted a preliminary article of peace with Spain. By its terms Spain, as the basis for the establishment of peace, agreed to relinquish all claim of sovereignty over and title to Cuba and cede to the United States Porto Rico and other islands of Spanish sovereignty, and also an island in the Ladrones to be selected by the United States. The disposition of the Philippines was to be determined by the treaty of peace. It further provided for the suspension of hostilities and for the evacuation by Spain of Cuba and Porto Rico. Such evacuation of Porto Rico was completed by October 18, 1898, and of Cuba January 1, 1899, under the agreement signed by the President. The treaty of

[1] Jones *v.* United States (131 U. S., 202, 217); Woolsey *v.* Chaplain (101 U. S., 75, 577).
[2] Ex. Journal III, 182, 134.
[3] Treaties, Their Making and Enforcement, 102, 103.

peace did not become effective until the exchange of ratifications April 11, 1899, almost a year thereafter.

The final protocol signed at Pekin September, 1901, by the foreign powers on the one hand and by China on the other, at the conclusion of the Boxer uprising, likewise was not submitted to the Senate. By this protocol the powers, on their part, agreed to evacuate, with certain exceptions, and within a certain period, the city of Pekin and the Province of Chihli, etc.[1]

Numerous agreements of this character might be cited in support of the proposition that any special agreement entered into by the high contracting parties, under the treaty of January 11, 1909, for the purposes therein authorized could be lawfully negotiated and executed by the President and would be valid agreements without the advice and consent of the Senate.

Agreements authorized by treaty need not be ratified.

The question of the power of the President and Senate to conclude a treaty for the settlement of future differences between the high contracting parties of a defined character, by the terms of which the Senate would have no voice in the particular case thereafter arising, was carefully considered and very ably discussed in the Senate during the consideration of the proposed arbitration conventions negotiated in 1904–5 by Mr. Hay and in 1911 by Mr. Knox.[2]

In discussing these reports Crandall on Treaties, Their Making and Enforcement, page 120, says:

> That the Senate can not delegate to another body a power conferred on it by the Constitution is clear. It seems equally clear that, if the United States, by a treaty entered into through the constitutional treaty-making organs—the President and the Senate—agrees to submit to arbitration, in a prescribed manner, an exactly and definitely described class of cases, or all cases or controversies, which may arise in the future between this Nation and other nations, and which can not be settled by negotiation, the *mere submission of an individual case so arising is not an exercise of the treaty-making power.* The consent of the Nation to the submission has already been given and the faith of the Nation pledged. It is immaterial whether the instrument by which the particular case is to be submitted, defining the issue and the terms of submission for the guidance of the arbitrators, is termed an agreement, a protocol, or a declaration. It is essentially an administrative act in the execution of an existing international treaty and a municipal law, provided the terms of the treaty are such as to leave no discretion in the matter and are not open to construction. The President, in whom is exclusively vested the power to conduct negotiations with foreign powers, alone can determine the fact that the controversy can not be settled by negotiation. But it is the undoubted right of the Senate as a coordinate branch of the treaty-making power to refuse to give its consent to the conclusions of a treaty by which the faith of the Nation is thus pledged.

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[1] Treaties, Their Making and Enforcement, 104.

[2] See reports Senate Committee on Foreign Relations, presented by Mr. Morgan (S. Doc. No. 155, 58th Cong., 3d sess.) and Mr. Lodge, Mr. Root, Mr. Cullom, Mr. Burton, Mr. Rayner (S. Doc. No. 89, 62d Cong.).

In this case the Senate did not refuse, but assented to the authority under the treaty of January 11, 1909, for the making of certain special agreements between the high contracting parties for certain specified purposes. Therefore, the consent of the United States to the making of such agreements has already been given and the faith of the Nation pledged thereto. Again, the special agreements thus authorized are essentially administrative and necessary for the accomplishment of the purposes for which the treaty was concluded. The Senate having given its consent to the making of these special agreements for the purposes set forth in the treaty, its advice and consent as to the details of such agreement, when made, is therefore not essential to its validity.

Subject matter of agreements under treaty of January 11, 1909.

The subject matter of any special agreement for the purpose of making the recommendations of the commission effective would be the use of these boundary waters, obstructions therein, and the construction or partial control and maintenance of existing controlling works or dams in waters flowing therefrom. The authority to thus provide for such use, etc., whether it involves a claim of right or goes beyond, involving international policy respecting such use, or is for the settlement or prevention of international disputes growing out of such use, either past or prospective, all are included. There are no exceptions. The treaty thus authorizing a special agreement for these purposes having been ratified by the Senate of the United States and enacted into law by the Parliament of the Dominion of Canada, the will of both countries has been expressed thereon, and all authority thereunder for the accomplishment of these purposes by special agreement is complete.

Authority to exercise the power of eminent domain authorized by the treaty.

If it is said that in the United States the exercise of the power of eminent domain requires either legislative or treaty authority, my answer is that this is true, but that in this case the exercise of the power of eminent domain as an incident to the enforcement of a duly authorized special agreement is now authorized in both countries; in the United States by treaty and in Canada by the enactment of the treaty into law.

That this is so, is manifest from the fact that without either express or implied authority under the treaty to exercise the power of eminent domain no special agreement requiring the exercise of that power to make it effective could be enforced, and to that extent the treaty would fail. "Treaties are to be interpreted in a favorable rather than an odious sense." (Wheaton, International Law, p. 390.) To hold otherwise would also be contrary to the general rule of construction applicable to all contracts, including treaties, that in the absence of express authority anything necessary to make effec-

tive that which is expressly authorized is held to be necessarily incident to the authority expressly granted.

If therefore the use for which the power of eminent domain is to be exercised in this case is a legally authorized public use the exercise of the power would be limited only by the principles of due process of law and just compensation. It may be noted also that the exercise of this power must be by and in the name of the parties to the agreement and only for the purpose therein set forth.

If, then, the high contracting parties by treaty have expressly authorized a subsequent agreement for a clearly defined purpose requiring the exercise of the power of eminent domain to make it effective, the authority for its exercise is of equal force and effect with that of the agreement itself. Any agreed plan of procedure therefore by which the Governments may jointly or severally acquire the right in both countries, subject to the laws of each to take and thereafter hold, either jointly or severally, such necessary rights or other property as may be required for the purpose of settling the questions of difference between them and of making the recommendations in this case effective is clearly authorized.

Article XIII defines what the special agreements referred to in Articles III and IV are understood and intended to include.

> In all cases where special agreements between the High Contracting Parties hereto are referred to in the foregoing Articles, such agreements are understood and intended to include, not only *direct agreements between the High Contracting Parties*, but also any mutual arrangement between the United States and the Dominion of Canada expressed by concurrent or reciprocal legislation on the part of Congress and the Parliament of the Dominion.

The question of whether or not there should be a special agreement or a mutual agreement under Article XIII for the purpose, does not, in my judgment, require consideration.

Any mutual arrangement between the United States and the Dominion of Canada would have to be expressed in concurrent or reciprocal legislation. This would not only be difficult to obtain, but would necessarily postpone indefinitely carrying out the recommendations herein, because the minds of the legislative bodies of both countries would have to agree before the necessary reciprocal legislation could be secured.

It has been pointed out, however, that a duly authorized special agreement would not be subject to these objections, because the authority for it has been ratified in both countries, and such ratification necessarily includes all implied as well as express authority. In order, therefore, to facilitate the final settlement of the questions and matters of difference set forth in the reference, I would respectfully suggest the adoption of the foregoing recommendation for a special agreement for that purpose rather than a mutual arrangement under Article XIII or a new treaty.

HIGH WATER ON RAT ROOT RIVER.

PLAN OF PROCEDURE.

Plan of procedure for acquiring necessary rights.

The lawful exercise of the power of eminent domain and expropriation, under Anglo-Saxon rule, involves three fundamental principles:

First. The purpose of its exercise (at least in the United States) must clearly appear and be a legally recognized public purpose.

Second. In both countries the procedure under which this power is exercised must conform in every particular to the requirements of due process of law, and

Third. The owners of the property taken, destroyed, or injuriously affected must be compensated therefor.

With respect to the public use for which the property in this case would be taken, it is recommended that it be declared to be, primarily, the settlement of the questions or matters of difference between the parties, as set forth in the reference, and to prevent similar questions from thereafter arising out of past or future use of these boundary waters along this part of their common frontier.

The purpose of this suggestion is manifest. Condemnation proceedings, in the United States at least, are instituted by petition setting forth, among other things, the purpose for which the property therein described is to be taken. Whether or not the procedure recommended in this case would conform to that required in Canada, I am not prepared to say; if agreed to, however, by the high contracting parties, it would be legal in both countries. In the United States, at least, it would have the advantage of judicial interpretation. It could be instituted by filing with the appropriate courts the substance of the special agreement, with the declaration as to the purpose for which the taking of property was necessary. This could be made to constitute the petition.

From the petition thus filed it would then appear that the property was to be taken, primarily, for the purpose of settling and hereafter preventing international disputes, involving the rights, obligations and interests of both nations in their relation to each other and in their relation to their respective inhabitants. All other and subsequent uses would be collateral and incidentally included in this declared public use.

In the settlement and prevention of international differences between two nations, the people of both are interested and benefited. It not only contemplates the settlement of existing questions of difference between them, but it removes certain causes for disagreement growing out of conflict of interest—conflict of interest involv-

ing the rights and obligations of each, which otherwise might lead to serious consequences and possibly to war. The settlement and prevention of international disputes by the taking of private property for that purpose would therefore be for the general good. Then, too, by thus providing for the use of these boundary waters and securing for the people of both countries their equal right to such use, the public interest in both countries would not only be directly benefited, but a spirit of international comity and good will would be created and thereafter maintained as the result of such taking. If this would not constitute a public use it would be hard to define what would.

While it is true that Governments are not migratory, or as Chief Justice Marshall, in Rose *v.* Himely (4 Cranch, 241, 279, 2 L. Ed. 608, 620), says:

> It is conceded that the legislation of every country is territorial, that beyond its own property it can only affect its own subjects or citizens.

Yet this does not prove that two Governments, by treaty, can not grant to each other the right to invoke the laws of their respective jurisdictions for a purpose mutually advantageous to both, or that either jointly or severally they may become suitors in the courts of the other. This right now exists and may under certain circumstances be exercised by the people of the United States and Canada under Article II of this treaty. Hence, the declared purpose for the taking of property in this case, being for a public use, each Government would acquire, and thereafter hold, either in common or in severalty, as they may agree, the property thus taken for the purpose declared in their petition and as approved by the final judgment of the court in which the property is situated.

Governments by treaty may grant to other Governments the right to invoke laws within national jurisdiction.

In so far as the taking of property for power development is concerned, when such development or the power to be created thereby is used for the generation of electrical energy for public purposes, such as lighting, heating, etc., or the taking of property for the development of water power as such for manufacturing purposes, that may or may not be such a public use as would justify the exercise of the power of eminent domain in the United States. If, however, the taking of property in this case, for the purpose of settling an international dispute as declared in said special agreement, constitutes such a public use as would justify the exercise of this power for that purpose, then it is unnecessary to consider or discuss the question of whether or not such taking for the development of water power, as such, is authorized by the laws of either country; for such use would only be incidental to the primary use for which the property is taken. The right to such incidental use and the terms and conditions upon which that right should be granted would be a

national, not an international matter, and could be granted or denied by each, independent of the other. Having taken the property lawfully, the Governments could then authorize such use thereof as would be lawful within their respective jurisdictions.

Public and private interests suggest International Joint Commission be authorized to carry out recommendations.

In the plan of procedure, hereinbefore recommended, I have suggested either the appointment of a new commission or authorizing the International Joint Commission to carry out that plan. This alternative recommendation is made because, as a member, I do not wish to place the International Joint Commission in the attitude of suggesting the exercise of functions or the performance of duties not now prescribed by the treaty. But at the final arguments at Washington, April, 1916, the opinion, as expressed by the legal representatives of riparian owners and all other private and corporate interests involved, was to the effect that the most satisfactory plan, so far as the interests they represented were concerned, would be for the parties to authorize the International Joint Commission to act in the premises.[1] It is because of this that I have suggested the alternative of said commission being made the instrumentality for carrying out any agreement the high contracting parties may enter into for making the recommendations, as approved and adopted, effective.

Apportionment of cost.

The plan suggested for the apportionment of the cost of securing all necessary rights, etc., to make the adopted recommendation effective, and at the same time provide "for the adequate protection and development of all interests involved on both sides of the boundary," deals only with the apportionment of such cost between the two Governments, leaving to them, within their respective jurisdictions, the matter of providing for their reimbursement, in whole or in part, whether by assessment of benefits against the property benefited, or otherwise. Any recommendation as to how the parties may be reimbursed by those directly or indirectly benefited is a national, not an international, matter.

As to the mode of procedure to ascertain the compensation to be awarded and paid on account of the property taken, destroyed, or damaged, and the securing the legal title thereto, I respectfully submit that the procedure outlined in the recommendation hereinbefore made would fully meet all the requirements of the laws of the United States, and, in my judgment, could easily be made to conform to the laws of the Dominion of Canada under any agreement for carrying into effect the recommendations as approved and adopted; whether it did or not, if agreed to, and the agreement is authorized, the procedure would be lawful, provided it was not in conflict with the principles of due process of law and compensation as interpreted by the courts of that country.

[1] Final Arguments, Washington, April, 1916, pp. 239, 292.

IS SCOPE OF REFERENCE LIMITED BY IMPLICATION?

The only other matter of difference concerning the final report is whether or not the ground upon which the commission decided against the contentions of counsel for both Governments and other interests in respect to the scope of the reference and the duty of the commission thereunder being restricted by implication should be discussed. It may be true that this difference between us involves only a question of propriety and not of principle. In some cases, however, questions of propriety equal in importance questions involving principles.

Examination and consideration of the questions of the reference necessitated, first, the determination of their scope. This involved a construction of the reference. Since this construction was contrary to the contentions of counsel, I maintain the parties to the reference, as well as counsel, are entitled to know the ground upon which the adverse decision of the commission upon the questions presented by counsel is based. Then, too, the provisions of the treaty and the duty of the commission thereunder are not generally known in either country and are not clearly understood even by some who appear before the commission. A discussion, therefore, when necessary, of the provisions of any reference or the treaty provisions involved, in support of decisions upon questions of this character, would in time result in a code of interpretation useful to the public and to the Governments. In my judgment, therefore, it is the duty of the commission to discuss questions of this character, and especially those involving its jurisdiction and duty under the treaty or under a reference. The arguments presented by counsel in this case were presented in good faith and in behalf of two great Governments. In the interest, therefore, of orderly procedure in all matters considered by this commission, I maintain that the commission is not justified in ignoring the contentions of counsel involving questions of importance or questions involving the jurisdiction and duty of the commission either under a reference or under the treaty.

For these reasons, I respectfully submit and assume entire responsibility for the following discussion in support of the decision of the commission against the position of counsel to the effect that the duty of the commission under the reference is restricted by implication.

In its study of the reference the commission sought, in the light of all the facts and circumstances as found from the evidence and from the report of its consulting engineers, to determine its scope, intent, and purpose. This seemed necessary because, under Article IX, the conclusions and recommendations of the commission must be subject "to any restrictions or exceptions which may be imposed by the terms of reference," whether express or implied.

Is Winnipeg River water powers excluded from consideration by implication?

As the result of this study, the commission found it impossible to sustain the objection of counsel for the United States, Mr. Wyvell, and counsel for riparian owners, Mr. Steenerson, to the consideration of evidence relating to the use of the waters flowing from the Lake of the Woods for power development in the Winnipeg River, because such waters are not within the scope of the treaty or the reference.

Mr. Steenerson argued that the authority of the commission was limited to questions relating to boundary waters, and then stated:[1]

> This is not a difference with reference to the use of waters outside of the boundary waters; it is a difference with reference to the use of boundary waters.

Considering the term "boundary waters," in so far as it refers to the *water* itself, it is apparent from the final report that the most important use of these boundary waters is for the purpose of producing power as they flow from the level of the boundary in the Lake of the Woods to the level of Lake Winnipeg in Canada.

Considering the term "boundary waters," in so far as it refers to a *body of water* confined within shores and varying in elevation above its bed, it is also apparent that the most advantageous use can be made of this boundary water by controlling its discharge over the rim of rock constituting its outlet, in order to equalize the outflow and thus to permit a very much greater portion of the *water itself* to be utilized in power development.

Moreover, under Article IX, the high contracting parties have agreed that any *other questions* or matters of difference arising between them involving the rights, obligations, or interests of either in relation to the other, or to the inhabitants of the other *along their common frontier*, shall be referred from time to time to this commission for examination and report. Therefore, the declaration of the parties to the reference, that questions have arisen out of the use of these waters, makes it imperative, in my judgment, for the commission to examine and report upon and give consideration to all facts and circumstances pertaining to the matters referred with a view to aiding the two governments in reaching a satisfactory settlement of these questions, and that, too, without reference to the provisions of the treaty. A report upon the questions of the official reference which disregarded the advantageous use of the outflow from the Lake of the Woods in power development on the Winnipeg River would aggravate, rather than settle, existing differences respecting the use of these waters. Unless these questions can be settled as the result of this examination the purpose of the two Gov-

[1] Public Hearings, Kenora, September, 1915, pp. 382–383.

ernments in submitting the reference will have been defeated. In view of these considerations the commission was unable to sustain the objection of counsel.

Shall effect of existing structures be considered?

Counsel for the Dominion Government, Mr. Anderson; for the Ontario Government, Mr. Keefer; for the City of Winnipeg, Mr. Campbell; and for the Winnipeg Electric Railway Co., Mr. Laird, all contend in favor of a more limited scope of the reference than the commission found to be justified thereunder. They argue in effect that the commission is precluded from considering the effect of the Norman Dam upon the levels of the Lake of the Woods and the extent and value of the lands hereafter submerged in consequence of any recommended level, because this dam and the use of the waters thereby secured existed before the date of the treaty.

In support of this Mr. Campbell argued that Article IV:

> Says that they "will not"—i. e., after the date of the treaty—"permit the construction or maintenance" of any works that shall effect the heights of boundary water.

Counsel for the Dominion Government, Mr. Anderson, arguing along the same line, said:

> The high contracting parties had no intention of submitting *past differences* with reference to these waters to the commission; that what had been done, the uses that had been made of the boundary waters, and the waters flowing into and out of them, were to be considered as properly done, or, at any rate, not subject to future consideration.

Counsel for the Electric Railway Co., Mr. Laird, in discussing this question, said:

> But I take it that this commission is prohibited from interfering with existing conditions. They are only to deal with future conditions and the future uses of these waters.

For the purpose of this report the questions thus raised are material only in so far as they may or may not limit the scope of the reference and the duty of this commission thereunder, and it is only in that connection I shall consider them.

If the conclusions of counsel are right, then the duty of this commission in the premises is limited to the consideration of the effect of any changes in existing conditions resulting from the maintenance of the recommended level.

The three main purposes for which the treaty of January 11, 1909, was concluded, are: "To prevent disputes regarding the use of boundary waters;" "To settle all questions which are now pending between the United States and the Dominion of Canada, involving the rights, obligations, or interests of either in relation to the other or to the inhabitants of the other along their common frontier;" and "To make provision for the adjustment and settlement of all such questions as may hereafter arise."

H. B. C. POST AT FORT FRANCES.

By the reference, the parties thereto have expressly stated that the questions or matters of difference referred are questions "which have arisen between them." From our examination and from the evidence it appears that some of the questions referred are questions that existed long prior to the treaty.

If the reasoning of counsel is correct, then none of these questions could be referred to, or dealt with, by the commission. It is evident, however, from the language of the reference, that this is not the interpretation which the parties themselves have given the treaty. They knew that the duty which they imposed upon the commission involved consideration of existing structures in these boundary waters and in the waters flowing therefrom, as well as the possible construction and operation of controlling works or dams, in order to secure that which they desired. In fact, they have said as much in question three, where they ask:

> In what way or manner, including the construction and operation of dams or other works at the outlets and inlets of the lake or in the waters which are directly or indirectly tributary thereto, *or otherwise*, is it possible and advisable to regulate the volume, use, and outflow of the waters of the lake so as to maintain the level recommended, etc.

There is no limitation here, either express or implied, in respect to the consideration of existing obstructions. The *outflow* from the lake could not be regulated *except through a change in the use of existing* structures. To argue, therefore, as counsel for the Dominion Government does, that "the high contracting parties had no intention of submitting past differences with reference to these waters," or that "the uses that had been made of the boundary waters and the waters flowing into and out of them" * * * were not to be "subject to future consideration," would, in effect, be a repudiation of some of the primary purposes of the treaty, and would also be in direct conflict with the practical interpretation thereof which the parties to the reference have themselves given it.

It is therefore impossible to hold that our duty under the reference is restricted to the examination and consideration only of conditions that may hereafter exist in consequence of the level recommended and omit entirely any consideration of the Norman Dam, its effect upon the normal level of the lake under natural conditions, or the use of this dam hereafter in regulating the outflow from the Lake of the Woods.

It was also argued by counsel for the City of Winnipeg that:

> A fair interpretation of the treaty recognizes the existing uses of the waters of the Lake of the Woods at the outlets, as matters stood when the treaty was made in the beginning of 1909. It recognizes also these uses under Article VIII. It recognizes the uses "heretofore permitted" under Article III, and, I claim, also under Article IV.

The attention of counsel being drawn to the fact that this reference was submitted under Article IX, involving only an examination of the questions submitted and a report thereon, counsel proceeded:

> Article IX is a request for information; practically that is all. The commission is requested to investigate, report, and recommend; but I take it that the treaty is to be read together, and that it was never contemplated that, under Article IX, something would be done, based upon recommendations, which ignored the other clauses of the treaty.

Then, too, it was argued by Mr. Anderson, of counsel for the Dominion Government:

> It may be that the commission will consider that, as a matter of propriety and as a matter of information to their respective Governments, they should make some report upon the natural condition of the lake levels. I submit that they should not.

Continuing, he says:

> My reason for saying that is this: In Article III of the treaty, the opening words of the paragraph that I have already read, are "it is agreed that, in addition to the uses, obstructions, and diversions heretofore permitted or hereafter provided for by special agreement between the parties hereto," etc. So far as the Canadian Government is concerned, they were more than permitted. They were active participants in the construction of it.

If in this case the commission was required to render a final decision under the treaty, counsel would be correct in saying: "The treaty must be read together," or that its different provisions, in so far as they are interdependent, must be construed together. But we are not rendering a final decision. We are required only to examine and report the facts and circumstances, together with appropriate conclusions and recommendations. The scope of our inquiry for this purpose is not to be found in the treaty but in the reference.

Under Article IX the parties may refer, for examination and report, any question involving the rights, obligations, or interests of either in relation to the other, or to the inhabitants of the other along their common frontier. If such reference calls for conclusions and recommendations, which can not be made effective under the treaty, that is not a matter for the commission to consider. We have but one duty; that is, to examine and report as requested by the parties.

In all matters referred under Article IX the commission acts as an advisory court and not, as under Articles III and IV, a court of last resort. The high contracting parties have expressly provided in this article that "such reports of the commission shall not be regarded as decisions of the questions or matters so submitted either upon the facts or the law and shall in no way have the character of an arbitral award."

If the questions referred call for conclusions and recommendations that contemplate the doing of something that could not be done without, as counsel say, ignoring certain provisions of the treaty or that would be in conflict therewith, the commission would not, for that reason, be justified in declining to answer the questions. The treaty, being a contract between the two Governments, may, by a new treaty, be modified, or certain provisions thereof may be declared to stand in abeyance in so far as they affect the subject matter of the reference. Therefore, the limitations of the treaty do not restrict the duty of the commission in its examination and report upon any questions referred. The reference alone governs as to this.

But assuming that the recommendations, to be effective, must be within the provisions of the treaty, the particular provisions on which counsel rely to prove that the Norman Dam and its effect upon the level of the Lake of the Woods can not be the subject of consideration and recommendation are Articles III, IV, and VIII.

The existence or the effect of the existence and maintenance of the Norman Dam, or its continued existence and future control for the purpose of maintaining the recommended level and the regulation of the outflow from the Lake of the Woods, is not, under any circumstances, a matter for consideration either under Articles III or VIII. By the express terms of Article III it applies only to uses, obstructions, and diversions of *boundary waters* and not to waters flowing therefrom.

That part of Article VIII which is relied on by counsel does not relate to obstructions in boundary waters at all, but wholly to the use of boundary waters. It is as follows:

> The following order of precedence shall be observed among the various uses, enumerated hereinafter, for these waters, and no use shall be permitted which tends materially to conflict with or restrain any other use which is given preference over it in this order of precedence.

Then follows the enumeration of the uses in the order of their precedence. This article then provides as follows:

> The foregoing provisions shall not apply to or disturb any existing uses of boundary waters on either side of the boundary.

That is, the order of precedence of existing uses shall not be disturbed.

It will be observed that under the provisions of both of these articles the waters, the obstructions of which has been "heretofore permitted" or hereafter authorized, must be boundary waters; that is, waters through which the boundary line between the two countries passes.

The Norman Dam is located in the Winnipeg River more than a mile below the western outlet of the Lake of the Woods. It is there-

fore an obstruction in waters flowing from boundary waters, and can be considered only, if at all, under Article IV, which is as follows:

> The high contracting parties agree that, except in cases provided for by special agreement between them, they will not permit the construction or maintenance, on their respective sides of the boundary, of any remedial or protective works or any dams or other obstructions in waters flowing from boundary waters or in waters at a lower level than the boundary in rivers flowing across the boundary, the effect of which is to raise the natural level of waters on the other side of the boundary, unless the construction or *maintenance thereof is approved by the aforesaid International Joint Commission.*

This article, therefore, does not apply to uses or diversions either of boundary waters or waters flowing therefrom. It makes no reference to existing dams or obstructions "heretofore permitted." It does, however, expressly prohibit the construction or maintenance of obstructions in waters flowing from boundary waters on either side of the boundary, the effect of which is to raise the natural level of waters on the other side except when authorized by special agreement between the high contracting parties or "*unless the construction or maintenance thereof is approved by*" *this commission.*

If Article III of the treaty were to govern the commission in its consideration of the future regulation of the levels of the Lake of the Woods and the use of its waters, and if, as argued by counsel for the Dominion Government, "the uses that had been made of the boundary waters and the waters flowing into and out of them" were not to be "subject to future consideration," the commission would be precluded from considering "such further use" of the waters of the Lake of the Woods, as is requested by the Winnipeg River water-power interests, in order that the outflow might be equalized far beyond any equalization attempted in the past. The use of the waters of the lake for navigation, fishing, and power purposes at the outlets would then receive prior consideration. This would limit the maximum draft on the lake to about 3 feet, and of course would not permit of the most advantageous use of these waters. The use of the Lake of the Woods as an equalizing reservoir for the Winnipeg River water power is essentially a new one. No "question of difference" existed at the time of the reference which involved this use. It is, however, made a proper subject for consideration by the commission under question one of the reference.

I therefore maintain that the scope of this reference and the duty of the commission thereunder involves consideration of the future effect of the Norman Dam upon riparian lands lying above ordinary high-water mark under natural conditions, and also consideration of the use of this dam in connection with the regulation of the water flowing from the lake for the purpose of securing its most advantageous use. I maintain further that such consideration is both authorized and justified by the provisions of the treaty and is neces-

sary in order to fully answer the three questions of the reference, and the commission so decided.

This interpretation of the treaty is clearly within the rule laid down by the Supreme Court of the United States in Tucker *v.* Alexandross (183 U. S., 424), where Justice Brown, delivering the opinion of the court, says:

> As treaties are solemn engagements entered into between independent nations for the common development of their interests and the interests of civilization, and as their main object is not only to avoid war and secure a lasting and perpetual peace, but to promote a friendly feeling between the people of the two countries, they should be interpreted in that broad and liberal spirit which is calculated to make for the existence of a perpetual amity, so far as it can be done without the sacrifice of individual rights or of those principles of personal liberty which lie at the foundation of our jurisprudence.

To give Article IV the interpretation contended for by counsel would be in direct conflict with the rule here stated, because it would not tend to "promote a friendly feeling between the people" of these two countries to continue the condition that gave rise to the questions and matters of difference between them, set forth in the reference. It would tend, rather, to aggravate them. Nor would this be an interpretation "in that broad and liberal spirit which is calculated to make for the existence of a perpetual amity" between the parties to this reference. On the other hand, my interpretation does not "sacrifice individual rights or those principles of personal liberty which lie at the foundation of our jurisprudence," because these rights and liberties, so far as they are involved in the continued maintenance of obstructions in these waters, existing at the time the treaty was made, can all be secured and protected by special agreement between the high contracting parties or by invoking the jurisdiction of this commission for that purpose, as provided by the treaty of January 11, 1909.

Dated at Detroit, Michigan, May 18, 1917.

JAMES A. TAWNEY.

We fully concur in the foregoing supplemental conclusions and recommendations.

OBADIAH GARDNER.
ROBERT B. GLENN.

EVENING ON THE UPPER WATERS.

Part III.

SUPPLEMENT.

I.—PHYSICAL CONDITIONS.

The Lake of the Woods forms part of the boundary waters between the United States and the Dominion of Canada. The Provinces of Ontario and Manitoba and the State of Minnesota meet at the head of the Northwest Angle Inlet, on the west side of the lake. Lying between the two great inland seas of Superior and Winnipeg, the Lake of the Woods as one sees it on the map of North America appears to be a comparatively insignificant body of water. Indeed, to anyone not thoroughly familiar with the region it is difficult to realize that this beautiful island-studded lake covers an area of nearly 1,500 square miles.

The Lake of the Woods has been known under a variety of names at different periods of its history. The Indians called the northern portion Kamnitic Sakahagan, which has been variously translated as Lake of the Woods and Island Lake; and the southern portion Pekwaonga Sakahagan, or Lake of the Sand Hills. Another Indian name is translated as Whitefish Lake. This is now applied to that portion of the lake east of Sioux Narrows. The northwest part of the lake was known as Clearwater Lake—now Clearwater Bay. Another Indian name applied to the lake was Minitie or Minnititi. During the period of French rule in Canada, the lake was variously known to explorers and fur-traders as Lac des Bois, Lac des Sioux, Lac des Iles, and in one case as Lac des Christineaux, a name more generally applied to Lake Winnipeg. The present name is, of course, a translation of the French Lac des Bois, which was itself probably a translation of one of the old Indian names. Rainy Lake was known to the Indians as Takamimouen, and to the early French travelers as Lac la Pluie, of which the present name is a translation. Similarly Rainy River was known as Riviére du Lac la Pluie. Winnipeg River, which carries the waters of the Lake of the Woods to Lake Winnipeg, has been known at various periods as Riviére Maurepas, Riviére Blanche, White River, and Sea River. The present name is a translation of the old Indian designation, Wi-nipi, meaning turbid water, which appears on the old maps as Ouinipique.

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Ouinipigon, Winnipeek, Winipic, Winnipeggon-e-sepe, and a score or more of variants.

The watershed tributary to the Lake of the Woods comprises, as already mentioned, an area of 26,750 square miles, of which 58 per cent is located in Canada and 42 per cent in the United States. The Canadian portion is located within the Provinces of Ontario and Manitoba, while the United States portion is located entirely in the State of Minnesota. The predominant characteristic of the watershed is an abundance of irregularly shaped lakes and numerous short, broken streams. These lakes and rivers make up 3,960 square miles, or 14.8 per cent of the total area. The international boundary follows the old canoe route of the fur traders from Lake Superior to the Lake of the Woods, and enters the watershed at North Lake. From there it runs through Gunflint Lake, Saganaga Lake, Knife Lake, Basswood Lake, Crooked Lake, La Croix Lake, Sand Point Lake, Namakan Lake, and thence via Kettle Falls to Rainy Lake. Connecting these larger bodies of water are several smaller lakes and streams with numerous rapids; the whole system constituting an almost continuous waterway. From Rainy Lake the boundary runs down Rainy River to the Lake of the Woods.

The waters flowing from the Lake of the Woods enter one of the largest drainage systems of the continent—that of the Nelson River—through which the surplus waters from the central forest region and a large portion of the prairie provinces of Canada, together with a considerable portion of Minnesota and North Dakota, find egress into Hudson Bay. The ridge at the eastern edge of the watershed, approaching to within 15 miles of Lake Superior, divides the region draining into Hudson Bay from that draining into the great St. Lawrence system; and that at the south divides this region from the Mississippi Valley drainage. Toward the upper waters of the St. Louis River there is an area of swamp which during high water overflows into the headwaters of each of the three greatest drainage systems of the continent. Any particular drop of water falling in this swamp area may ultimately finds its way either to Hudson Bay, the Gulf of St. Lawrence, or the Gulf of Mexico.

The climate is typical of interior regions located in similar latitudes. The temperature varies from an extreme maximum of 100° above zero during July to an extreme minimum of 50° below zero during the winter months. On account of the influence of the forests and lakes the summer temperatures are not so high nor the winter temperatures so low as in the prairie region to the westward. The average annual precipitation is about 25 inches, of which 5 inches occurs as snow during the winter months.[1]

[1] See Report of Consulting Engineers, Tables 1–5; Plates 1–13.

The curious phenomenon of the lower lakes reaching their flood stages several months after the spring breakup and rains may here be witnessed. The reason for this is that each of the many upper lakes forms an equalizing basin which retards the incoming waters and produces such uniformity that the last of the chain, the Lake of the Woods, rises slowly, generally attaining its highest level in July, and then as slowly falls again.

From the narratives of the early fur traders and explorers who first crossed Rainy Lake and the Lake of the Woods, we have more or less broken accounts of the physiography of this region, some of which will be noted in subsequent chapters.

At later dates, eminent geologists from both countries have made available a number of excellent reports concerning the various rock formations, ore-bearing strata, and surficial soils. In connection with this present investigation the commission has during its surveys of the past three years procured a large amount of physical information bearing principally upon the character of the lands affected directly by the level of the waters in the different lakes.

A description of the physical geography of the Lake of the Woods watershed can hardly be complete, however, without tracing the rôle played by glaciers in the formation of its surface. During the glacial period, which has been variously estimated by geologists as closing from six to ten thousand years ago, the entire upper portion of the central valley of North America was covered by a mass of ice. The greatest thickness over Beltrami County in Minnesota has been estimated at 1,000 feet. This great extent of ice joined the Arctic fields on the north and extended southward approximately to the line of the Ohio and Mississippi Rivers. In the Seventh Annual Report of the United States Geological Survey the extent of the ice invasion is described as follows:

> There was indeed a succession of advances and retreats, but it is often convenient to speak of the whole as one great onset of ice, though it now appears that there was at least one very prolonged interval, besides several minor ones. The most striking fact respecting the limitation of the drift-stream tract of the interior is its approximate coincidence with the Ohio and Missouri Rivers. In the former case it can only be regarded as accidental, while in the latter case the relation seems to be causal in some measure, for the course of the present Missouri appears to have been much influenced by the invading ice. * * * The rock scourings are the trails left by the invader. Their character should reveal the nature of the ice visitant as tracks reveal the track maker. The track of a glacier is as unmistakable as that of a man or a bear.

Toward the close of the glacial period the amelioration of the climate caused the ice sheet to recede up the Mississippi Valley. When by melting away the mass passed the divide which separates the waters draining into Hudson Bay from those draining into the

Gulf of Mexico, a lake was formed with the divide as its southern and the ice barrier as its northern shore. This lake, since called Lake Agassiz, fed by glacial melting, spread northward and covered a considerable portion of Minnesota, Manitoba, North Dakota, Ontario, and Saskatchewan.

Roughly the boundary of Lake Agassiz in the Lake of the Woods district extended from a slight distance south of Red Lake easterly to an intersection with the Big Fork River, thence northeasterly to the middle portion of Rainy Lake, thence northerly to the outlet of Lac Seul, thence northwesterly to a point below the outlet of Lake Winnipeg. Its outlet for a time was through Browns Valley, the point where the sources of the Red and Minnesota Rivers meet. Here as time elapsed the outlet channel became deeper, and the lake accordingly lower, thus accounting for the gravel beaches found at different elevations in northern Minnesota and in Manitoba. Eventually a northern outlet to the waters of Lake Agassiz was formed, so that now the remaining lakes, such as the Lake of the Woods and Lake Winnipeg, held by natural barriers, are left as miniature representatives of the greater body.

The leveling action of the ice sheet has been so thorough that at no part of the watershed does the elevation above sea level greatly exceed 2,000 feet. Along the boundary the elevations ascend from 600 feet above sea level at Lake Superior, up the precipitous Pigeon River to about 1,800 feet at the divide, from which a descent is made to 1,060 feet above sea level at the Lake of the Woods. Where the 49th parallel crosses the Red River of the north at the very interior of the continent, the elevation is only 750 feet above sea level, the lowest point on the international boundary between Lake Superior and the Pacific slope.[1]

The Lake of the Woods watershed presents two general types of surface formation. The first and most extensive may be divided roughly from the other by a line extending from the west point of Vermilion Lake in Minnesota, northwesterly to the outlet of Rainy Lake, and thence in the same direction to the southern extremity of Shoal Lake. The first portion, which lies northeast of this line, may, except for isolated areas, be termed driftless, with scanty soil covering and frequent rock outcrops. The outcropping rock consists of granite, gneisses, schists, and agglomerates, with sedimentary rocks appearing eastward from Rainy Lake, and certain volcanic formations bordering the Lake Superior height of land. From Lake Vermilion a ridge of granite iron-bearing formation, commonly known as the Vermilion Range, extends northeastward into Canada, crossing the international boundary at Gunflint Lake.[2]

[1] See The Glacial Lake Agassiz, by Warren Upham, United States Geological Survey, Monograph XXV.

[2] See W. A. Johnston, Rainy River district.

The other district to the southwest of the general line previously described is covered by a deep glacial drift. Part of the surface formation here has been altered by the action of Lake Agassiz in the depositing of various clays and sands. In certain localities deposits of marl are found, while in others it is possible to trace the successive levels of the old lake by gravel beaches cast up at different elevations. The surface soil varies from a clayey to sandy loam and when cleared of timber produces all crops suitable to the latitude.

A considerable portion of this area of glacial drift, which has not been artificially drained, consists of partially forested swamp caused by the growth of moss on the uneven surface or by the work of beavers in building dams. Where the water in the swamps is five feet or more in depth, a growth called muskeg is formed, consisting of moss which fills the water sufficiently to hide it, but yields to the foot so that one may sink waist deep. During the centuries required to form these swamps, the disintegrated vegetation has been deposited on the impervious bottom of the natural pockets forming layers of peat. A depth of 12 feet of peat is not uncommon in the larger swamps of Beltrami and Roseau Counties in Minnesota.

The underlying rock of the deep drift area is indicated by outcrops at Long Sault Rapids, Manitou Rapids, Rapid River, Long Point, Rocky Point, and Zippel, which generally consist of schists or slates. In the vicinity of Swift to the south of the Lake of the Woods several artesian wells have been sunk.

The drainage system of the upper portion of this region has been termed "immature" by geologists. This is indicated by the large number of lakes some of which are entirely landlocked, by the absence of large streams, and by the fact that the rivers are generally a series of lakes or pools connected by rapids or falls. Most of the lakes have had a mixed origin, owing their existence to preglacial erosion which scooped out deep valleys, and then to the drift which left dams across these valleys at intervals, forming the chains of lakes we now find in certain districts. The Lake of the Woods and Rainy Lake both appear to be of mixed origin, the northern shores being formed by the bare glaciated rocks while the southern shores are formed by a gently sloping drift.

Referring to the physical characteristics of the Lake of the Woods, A. C. Lawson says:

> The Lake of the Woods is naturally divided into two distinct parts, having strongly marked differences in their physical aspects. The northern portion has an excessively irregular, rocky coast line, and its whole expanse is thickly studded with islands, varying in size from mere rocky islets to masses of land many miles in extent. The southern portion presents the contrasting character of a broad sheet of shallow water almost totally free from islands, contained by low, sandy or marshy shores of gentle sinuous outline, in which rock exposures are extremely few, the whole in remarkable opposition to the jagged cliffs and tortuous, island-blocked channels of the northern portion.

The line of demarkation between these two naturally distinct portions of the lake is nearly coincident with the international boundary line from the Northwest Angle to the mouth of Rainy River, were that line to bend around so as to pass the southern extremity of Bigsby Island and strike the main shore south of Little Grassy River, it would separate as nearly as possible the two portions of the lake thus characterized.[1]

On the steep rocky shores of all the lakes of this watershed, marks of lichens, remaining after the action of the water, are the means by which nature has preserved records of previous stages of water. These lichen marks have been of great importance to the various engineers investigating hydraulic problems, since they give an indication of flood stages reached in the past and which may recur in the future. The effect of the disintegrating action of the lichens which everywhere cover the rocks has been described as follows:

The present aspect of the glaciated rock surfaces along the water's edge bears much the same relation to that of the lichen-covered rocks away from the water as a polished and engraved surface of steel might do to that of a similarly engraved but rusted piece of iron. The waters of the lake have evidently had a protecting influence upon the rock surfaces along their shores, keeping them from the organic acids of vegetation and the carbonic acid of the atmosphere, which have eaten into the surface elsewhere, and rendered the grooves and striæ faint and sometimes scarcely perceptible.[2]

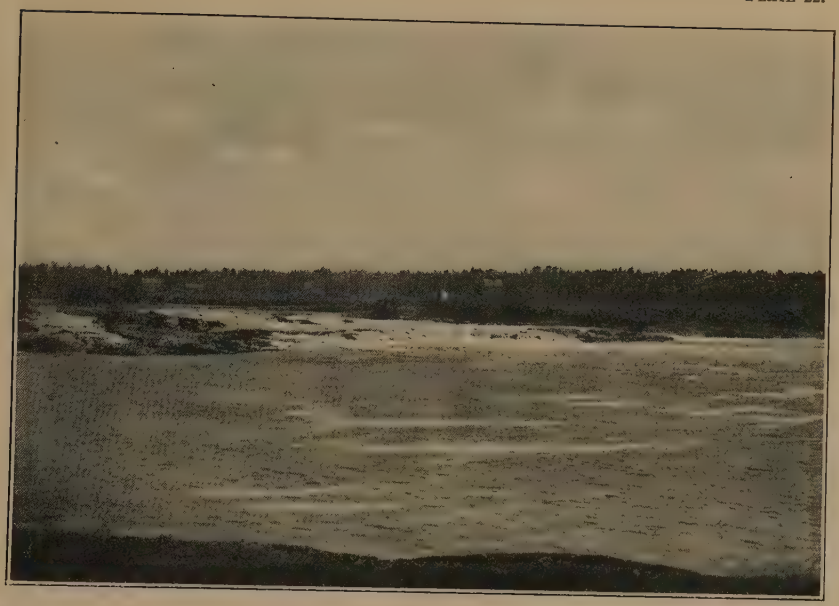
Speaking of the southern portion of the Lake of the Woods as it was in 1873, Dr. George M. Dawson says:

The southern and larger part of the lake, properly called Sand Hill Lake, washes bare Laurentian rocks along its northern edge, while the whole of its southern and southwestern margin is formed of sand and detrital matter and sweeps round in large gently rounded bays very different from the narrow irregular passages of the north. This southern portion of the lake is also comparatively shallow and perpetually extending its border southward and westward among the swamps, sand hills, and lagoons by which it is there surrounded and spreading detritus thus obtained over its bed. The evidence of this is everywhere apparent along its southern margin where tamarack swamps are in some places so rapidly encroached on that the trees may be seen along the shore bending forward at every angle and falling into the lake. Some parts of the shore have in this way become surrounded by an almost impassible belt of tangled and waterworn trunks and branches.[3]

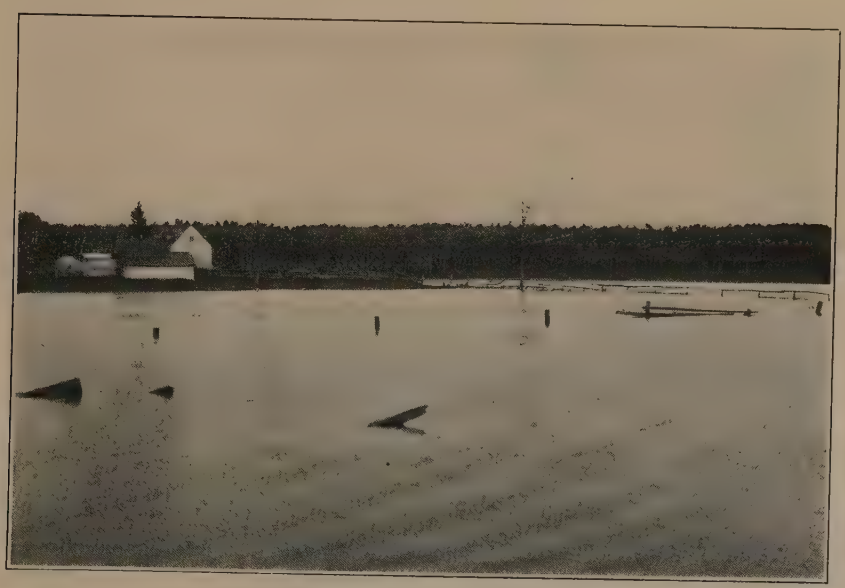
Captain Twining, in his report as chief astronomer to the United States Northern Boundary Commission, says of the Lake of the Woods as he found it in 1872–73:

The western and southern shores are bordered by vast swamps, the division between the swamps and the lake being distinctly marked in some places by small ridges of sand hills, but generally only by a narrow sandy beach, or an accumulation of driftwood and brush. * * * The Lake of the Woods re-

[1] A. C. Lawson, Report on the Geology of the Lake of the Woods Region, p. 115.
[2] Idem, p. 28.
[3] Report on the Geology and Resources of the Region in the Vicinity of the Forty-ninth Parallel, pp. 203–204.



a, KOOCHICHING FALLS IN A STATE OF NATURE.



b, FLOODED HOMESTEAD, RAT ROOT RIVER.

ceives two additional tributaries, one from the southwest called the War Road River, and another from the west, called Reed River. These streams are simply small channels cut in the marshes or muskegs. They drain a width of marsh varying from 8 to 16 miles in width.[1]

Incidental references are found in the narratives of several of the early travelers to marked variations in the level of the lake at various periods. Alexander Henry says in his Journal,[2] on August 7, 1800:

Before daybreak the wind fell, when we embarked, and finding the water high passed the little Portage du Lac des Bois under full sail. This was looked upon as extraordinary; we commonly carry our canoes and baggage at this place upwards of half a mile, and sometimes a full mile, according to the state of the water.

Professor Keating, who visited the lake in 1823 in connection with a United States Government expedition,[3] says:

With a view to avoid a circuitous navigation round a projecting peninsula, it is usual for voyagers to make a small portage over this point. It did not exceed 100 yards at the time we crossed it (August, 1823). Our guide says that it is often under water so that the canoes pass without difficulty. This requires a rise of about 5 or 6 feet above the level of the waters at that time.

Captain John Palliser was on the lake on July 4, 1857, and says:[4]

On coming to that portion of our route known as the Portage des Bois we found the lake waters so much above their usual level that we were able to sail right over it.

Captain Butler writes under date of August 2, 1870:[5]

We set sail for a strait known as the Grassy Portage which the high stage of water in the lake enabled us to run through without touching ground.

The maps and reports of the Geological Survey of Canada show that in 1881 this portage was covered with water, while in 1883–84 it was dry land. Dr. George M. Dawson, referring to Reed River on the west side of the lake, in August, 1873, says:[6]

On entering the mouth of Reed River, a sand bar is crossed, the water on which is apparently not more than 5 feet deep. The lower portion of the river itself, for about 4 miles, is both wide and deep and not very tortuous.

The consulting engineers of the commission found the water in July, 1913, 4 feet deep in the shallowest part of Tug Channel; that is what is now known as French or Dry Portage. At the same time there were 2 to 2½ feet of water over the bar at the mouth of Reed

[1] Reports upon the survey of the boundary. Washington, 1878, pp. 53, 55.
[2] New Light on the Early History of the Greater Northwest. Vol. 1, p. 25.
[3] Narrative of an Expedition to the Sources of St. Peter's River, etc., vol. 1, p. 110.
[4] Journals, Reports, and Observations Relating to the Exploration of British North America, p. 34.
[5] Great Lone Land, p. 60.
[6] Report on the Geology and Resources of the Region in the Vicinity of the Forty-ninth Parallel, p. 273.

River, and the river was about 50 feet wide and 15 feet deep a short distance from its mouth.

The temperate climate, together with the great number of lakes, which comprise about 15 per cent of the area of the entire watershed, combine to give a natural regulation to the waters of the Lake of the Woods seldom obtained even with extensive artificial works.

In order to convey some idea of the volume of water corresponding even to 1 foot of depth on some of these lakes, it may be stated that in the Lake of the Woods a depth of 1 foot is equivalent to 41.4 billion cubic feet of water, while the corresponding volume for 1 foot on Rainy Lake is 9.6 billion cubic feet. Speaking in other terms, a depth of 1 foot on the Lake of the Woods would supply 1,313 cubic feet per second for one year, while 1 foot depth on Rainy Lake would supply 305 cubic feet per second for the same period.

There are a number of sites on the upper watershed in both countries where water power could be developed, in both Canada and the United States, should increasing population demand it, but this can be more conveniently dealt with in another chapter.

The region tributary to the Lake of the Woods presents a number of types of physical conditions. These conditions have in a manner controlled the important industries now thriving on the watershed. We find a surface ranging from alluvial lake bed to bare rock with scanty soil, or an area covered entirely by forest, except where artificially cleared. We find one portion well fitted for agricultural purposes and another for forestry and mining. The numerous lakes and rivers offer opportunity for fisheries, navigation and water power, in addition to their scenic charm.

II.—HISTORY OF THE REGION.

Which among white men first saw the Lake of the Woods is a question not entirely free from doubt, but such evidence as is available points to Jacques de Noyon, a native of the town of Three Rivers, on the St. Lawrence. In the year 1687 or 1688, de Noyon ascended the Kaministikwia River, which empties into Lake Superior where the city of Fort William now stands, and following a chain of lakes and streams, with many portages, up to the height of land and down by other waterways to the lake of the Crists or Cristinaux, which we know to-day as Rainy Lake, built a small trading post at the western end of this lake, or on the banks of the Tekamimouen or Ouchichiq River (Rainy River), where he spent the winter.

The only known account of de Noyon's journey is contained in a memoir by the Intendant Bégon, dated 12th November, 1761,[1] and from this we learn that the following spring the explorer with a party of Indians descended Rainy River to the Lake of the Woods. Begon's description leaves no doubt as to the identity of the stream. "About two leagues after entering the river," he says, "there is a fall where a small portage is required, and there are also two other small falls where portages also require to be made, and then we come to Lac aux Iles, otherwise called Asiniboiles." The first fall mentioned is that which breaks the stream between Fort Frances and International Falls; the other two are Manitou Rapids and the Long Sault.

"On entering this lake (Lake of the Woods)," continues Begon, "to the left the country is barren, and on the right-hand side it is provided with all sorts of trees and filled with numerous islands." At the end of the lake, according to Indian report, there was a river emptying into the "Western Sea." The Mer de l'Ouest, or Western Sea, had been the goal of French exploration from Canada almost from the founding of the colony. As the tide of discovery rolled westward, the elusive Western Sea receded before it. Obviously, the great body of water which the Indians described to de Noyon, and which Begon calls the Western Sea, was what we know to-day as Lake Winnipeg. At a later date it was sought for far to the west and southwest, across the great plains. It remained, in fact, for Alexander Mackenzie to finally prove that a vast continent lay between the St. Lawrence and the true Western Sea.

[1] Margry, Découvertes et établissements des Français, v. 6, p. 495 *et seq.*

But this is getting away from the subject. The year after the date of Bégon's memoir, Lieutenant Zacharie Robutel de La Noüe followed the same route traveled by de Noyon, from the mouth of the Kaministikwia to Rainy Lake, which he calls Tekamamiouen, and where he built a small stockaded fort. La Noüe does not appear to have gone any farther to the west, and therefore never saw the Lake of the Woods.

No further attempts at western discovery appear to have been made until the year 1731, when Pierre Gaultier de la Vérendrye began the long series of explorations to which he was to devote the remainder of his life. He set out from Montreal in the early summer of that year, with his three sons, Jean-Baptiste, Pierre, and François, his nephew La Jemeraye, and a party of soldiers and voyageurs, about 50 in all. They reached the western end of Lake Superior toward the end of August. Unlike De Noyon and La Noüe, La Vérendrye had decided to follow a new route to the west, by way of Pigeon River, what was later known as the Grand Portage route. Because of trouble with his men, he sent La Jemeraye ahead with a small party, while he with the remainder wintered at the Kaministikwia.

La Jemeraye got through to Rainy Lake, and built a post which he named Fort St. Pierre, in honor of the leader of the expedition, on Rainy River near the place where it leaves the lake of the same name. The fort stood on what is now known as Pithers Point, and its site was still recognizable a few years ago.

On June 8, 1732, La Vérendrye with his men set out for Fort St. Pierre, taking over a month to traverse the intricate chain of small streams and lakes, with their numerous portages, connecting Lake Superior and Rainy Lake. After a short rest at the fort, the entire party, escorted by 50 canoes of Indians, descended Rainy River to the Lake of the Woods, crossed the lake to what was many years later known as the North West Angle Inlet, and built Fort St. Charles on its southern side, in what is now an isolated fragment of the State of Minnesota. This is notable as the first trading establishment, in fact the first habitation of white men, ever built on the shores of the Lake of the Woods. It is described in one of La Vérendrye's journals as follows:

> The interior of this fort measures 100 feet with four bastions. There is a house for the missionary, a church, and another house for the commandant, four main buildings with chimneys, a powder magazine, and a storehouse. There are also two gates on opposite sides, and a watchtower, and the stakes are in a double row and are 15 feet out of the ground.

In the same journal he describes Fort St. Pierre:

> A fort with two gates on opposite sides. The interior length of the sides is 50 feet with two bastions. There are two main buildings, each composed of two rooms with double chimneys. Around these buildings is a road 7 feet wide; and in one of the bastions a storehouse and a powder magazine have been made, and there is a double row of stakes 13 feet out of the ground.

OJIBWAYS AT FORT FRANCES.

For many years interest has been taken in the exact location of Fort St. Charles. La Vérendrye's journals were somewhat vague on the subject, and while the existence of the fort or its ruins seems to have been known to the traders of the North West Company, their references to it are never more exact than that it stood on the west side of the Lake of the Woods—not a very helpful description in view of the extent and character of the west shore.

Louis Antoine Bougainville, in his Memoir on the French Posts, in Margry's Relations et Mémoires Inédits, 1867, says:

> Fort St. Pierre is situated on the left bank of Lake Tekamamiouen or Rainy Lake, at 500 leagues from Michilimakinak and 300 from Kamanistigoyia or Three Rivers at the northwest of Lake Superior. Fort St. Charles is 60 leagues from that of St. Pierre, situated on a peninsula that juts far into the Lake of the Woods.

Bougainville came to Canada in 1756, a few years after the death of La Vérendrye, and no doubt had the description from one of the explorer's sons.

In 1902 a search party from the College of St. Boniface, Manitoba, under the leadership of the Archbishop of St. Boniface, were guided by an Indian chief, Powassin, to a point on the north shore of the Northwest Angle Inlet, where the chief said he had seen some mounds with square stones showing above the surface, and that, according to the traditions of his tribe, these mounds were the ruins of fireplaces built by the French before the English had come into the country. The St. Boniface party made excavations at the site and brought to light an old fireplace with square stones laid regularly so as to form three sides of a quadrangle, and a layer of ashes some 8 inches deep.

Satisfied that they had discovered the remains of Fort St. Charles, they erected a cross to mark the spot. Further excavations in 1905, however, tended to throw doubt on the authenticity of the site, and the matter was allowed to remain in abeyance until 1908, when another party of professors from St. Boniface, under the leadership of Rev. J. Paquin, S. J., finally solved the problem. Satisfied that the place they sought was not on the north side of the inlet, they tried the south shore, and finally discovered the site of Fort St. Charles about 2 miles west of American Point. Five days hard work uncovered a large double fireplace with two smaller ones, and the rotten stumps of posts buried in the clay. Several human skeletons were also discovered, with shoe buckles, knife blades, bullets, and other metallic articles, some of which were readily identified as of French manufacture.

Incidentally, the St. Boniface party succeeded in identifying with reasonable certainty two of the skeletons as those of Jean-Baptiste de la Vérendrye and Father Aulneau, who, we know from La Vérendrye's narative, had been murdered by the Sioux on what is

known as Massacre Island in the Lake of the Woods. An account of this tragic incident in the early history of the lake will be found in Burpee's Search for the Western Sea.

La Vérendrye and his sons pursued their western explorations, until they were cut short by the death of the father in 1749. During this period Fort St. Pierre and Fort St. Charles were maintained as trading posts and bases for the explorers.

In 1750, Captain Jacques Repentigny Legardeur de Saint-Pierre, who had been appointed to carry on the western explorations of La Vérendrye, visited Fort St. Pierre and Fort St. Charles on his way to Fort La Reine on the Assiniboine. Three years later Saint-Pierre returned to the East by the same route, having been replaced in command of the western posts by an officer named De La Corne, who no doubt also visited the forts on Rainy River and the Lake of the Woods.[1] This completes the meager history of the Lake of the Woods region during the period of French rule in Canada. It may be interesting to note that all the explorers named were natives not of old France but of Canada.

Canada, in the language of a recent writer, had scarcely been handed over to England before British traders began to make their way into the west by way of the Great Lakes to reap the harvest of peltries for which French explorers and traders had sown the seed. Who the first British traders were that reached Lake Winnipeg by way of Rainy Lake and the Lake of the Woods there is now no certain means of knowing. In a letter from Benjamin and Joseph Frobisher to General Haldimand it is said that the first adventurer went west from Michilimackinac in 1765; that the Indians of Lake La Pluie or Rainy Lake, having been long destitute of goods, owing to the disorganization of French trade in the west after the surrender of Canada, stopped this adventurer and plundered his canoes, and would not suffer him to proceed farther; that he attempted again the year following and met with the same bad fortune; that another attempt was made in 1767, goods being left at Rainy Lake to be traded with the natives, who permitted the adventurer to proceed with the remainder; and that the canoes on this occasion traversed the Lake of the Woods and penetrated beyond Lake Winnipeg—how far or in what direction, or who the traders were, the Frobishers do not say.

It appears, from the narrative of Jonathan Carver,[2] that he met these or other traders at Grand Portage in the summer of 1767, and that they had already proceeded as far as Fort La Reine, on the Assiniboine, where they had opened up a trade with the Assiniboine and Cree. From other sources it appears that a trader from Montreal

[1] Burpee, Search for the Western Sea, p. 281.
[2] Travels Through the Interior Part of North America, 1798, p. 87.

named James Finlay reached the Saskatchewan in 1767, and that one Thomas Curry followed him in 1770. Both these fur traders must, of course, have followed the route through Rainy Lake and the Lake of the Woods, but it is evident that they did not establish any trading posts on these waters, and there is nothing to show that they made any use of Fort St. Pierre or Fort St. Charles, which very probably may have fallen into decay or been destroyed by the Indians in the interval.

In June, 1775, Alexander Henry reached Grand Portage on a trading expedition to the west. He proceeded by way of the Grand Portage route to Rainy Lake and the Lake of the Woods, and from thence descended the Winnipeg River to Lake Winnipeg and the Saskatchewan. In his narrative he says:

> We now entered Lake a la Pluie, which is 15 leagues long by 5 broad. Its banks are covered with maple and birch. Our encampment was at the mouth of the lake, where there is a fall of water of 40 feet, called the Chute de la Chaudiere. The carrying place is 200 yards in length. On the next evening we encamped at Les Fourches (now the Big Forks) on the River a la Pluie, where there was a village of Chippewas of 50 lodges, of whom I bought new canoes. They insisted, further, upon having goods given to them on credit, as well as on receiving some presents. The latter they regarded as an established tribute, paid to them on account of the ability which they possessed to put a stop to all trade with the interior. I gave them rum, with which they became drunk and troublesome, and in the night I left.[1]

Henry describes the Lake of the Woods as 36 leagues long.

"On the west side," he says, "is an old French fort or trading house, formerly frequented by numerous bands of Chipeways, but these have since been almost entirely destroyed by the Nadowessies (Sioux). When strong, they were troublesome. On account of a particular instance of pillage, they have been called Pilleurs."

The first trading establishment of the North West Company in the Lake of the Woods district was that known as Rainy Lake House, or Fort of Lake La Pluie. It is uncertain when this post was built, but in the Journal of John McDonnell[2] of 1793 it is referred to as follows:

> In sight of the fort of Lake La Pluie is the Kettle Fall, causing a portage. The fort stands on the top of a steep bank of the river. It has two wooden bastions in front flanking the gate.

David Thompson, who visited the post in 1797, says[3] it stood half a mile below the Falls. On the other hand, Alexander Mackenzie,[4] in his General History of the Fur Trade (1801), described it as standing 2 miles below the Falls, "situated on a high bank on the north side of the river, in 48.37 north latitude. Here," he adds,

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[1] Travels and Adventures in Canada and the Indian Territories, p. 239.
[2] Burpee, Fur Traders of the West.
[3] Coues, New Light on the Early History of the Greater North West. I. 20.
[4] Mackenzie, Voyages from Montreal Through the Continent of North America. Rep. 1902, p. xciii.

"the people from Montreal come to meet those who arrive from the Athabasca country and exchange lading with them."

In 1799 Peter Grant was in charge of the post, and was succeeded by Dr. John McLoughlin, in later years, after the amalgamation of the North West and Hudson's Bay Companies, one of the leaders of the fur trade on the Pacific coast. In any event, Rainy Lake House must have been built some time before 1793 and after 1775, as it is not mentioned in Alexander Henry's Travels and Adventures.

The Hudson's Bay Company also built a post on Rainy River about where the town of Fort Frances stands to-day.

It was rebuilt many years afterwards and named Fort Frances, after the wife of Sir George Simpson, governor of the company. In fact, the Hudson's Bay Company must have had more than one trading post on Rainy River before 1800, for in his journal of that year Alexander Henry writes:[1]

> We camped below Manitou Rapids * * *. At daybreak we embarked and passed the old H. B. Co. establishment, which has been abandoned for several years. Soon after we came down the Long Sault. At 12 o'clock passed Rapid River, at 2 o'clock passed another old H. B. Co. establishment, and soon after came to the entrance of Lake of the Woods.

Jesuit missionaries accompanied La Vérendrye into the Lake of the Woods country and did what they could to Christianize the natives. Many years later Protestant missionaries attempted the same field, as appears from the following entry in the minutes of the council of the Hudson's Bay Company, held at Norway House in 1842:

> That a commissioned gentleman's allowance be forwarded from York Factory to each of the following Wesleyan missionaries: * * * Mr. Mason, Lac La Pluie.

The first attempt by an American company to enter the fur trade of the then northwestern frontier was made by the old South West Company, to which, in the name of Toussaint Pothier, in the winter of 1811 or spring of 1812, a patent was issued for property for a trading post at the strait of Mackinac. The patent itself was captured by a British party during the war of 1812, and nothing further was apparently done to enter the fur trade in this region until after the war.

Michilimackinac, or Mackinac as it was afterwards called, was a point of strategic importance from a commercial point of view, and through this post passed the trade from the district of Fond du Lac, so called from a post of that name at the place where the city of Duluth stands to-day. The district of Fond du Lac first consisted of the upper Mississippi posts at Leech Lake, Pokegame Lake, and Sandy Lake, together with the Red Lake post. Later the confines of the district were extended northward to the boundary, to

[1] New Light on the Early History of the Greater Northwest. I, p. 21.

FORT FRANCES IN 1857.

take in the entire United States portion of the Lake of the Woods watershed.[1]

The property and stock of the old South West Company was held principally by John Jacob Astor, of New York, and McTavish and Company, of Montreal. In 1815–16 Congress, in hope of excluding foreign competition in the frontier region, enacted a law prohibiting any one not a citizen from engaging in the Indian trade. Soon after Astor bought out the McTavish interest and formed the American Fur Company. The property was taken over in April, 1917, at Montreal, by Ramsay Crooks in behalf of Astor. Shortly after this the American Fur Company purchased from the North West Company the posts at the headwaters of the Mississippi, which this company had maintained here for a number of years. This purchase was the first step made by an American company in entering the fur trade on waters flowing into the Lake of the Woods. On June 20, 1817, Crooks writes to William Morrison, from St. Marys Falls on Lake Superior:

I came to this place yesterday in the hope of possible meeting with and handing you in person the inclosed letter from Mr. Rocheblave, by which you will perceive the Northwest Company have sold to Mr. John Jacob Astor, of New York, all the interest they hold in the department of Fond du Lac now in your charge. * * *

With the property of the North West Company, the American Fur Company became heir to the former company's ruthless competition with the Hudson's Bay Company. The law previously passed by Congress was designed to prohibit the engagement in American trade of agents of either of the Canadian companies. It was provided that each trader must be a citizen of the United States and must procure a bonded license from the agent of Indian affairs.

Referring to the early difficulties with the Hudson's Bay Company, then controlled by Lord Selkirk, Crooks writes from Mackinac to Astor on June 23, 1817: * * *

* * * And by indirect advice from Fond du Lac our affairs in that quarter are likely to be more advantageous than we could have expected from the state of that department at the beginning of last winter, and the large stories circulated by the N. W. Co. of the amount of property seized by Lord Selkirk's emissaries, who it now appears, restored all they had taken—the real state of the business, however, can not be known till the arrival of Mr. Morrison, which I look for in 10 or 15 days.

[1] These notes on the American fur trade are based principally upon information contained in the old letter books of the American Fur Company, 1816 to 1825, photostat copies of which are in the possession of the Wisconsin Historical Society. The manuscript reproductions were, through the courtesy of this society, forwarded to the Minnesota Historical Society of St. Paul for reference. The old letters consist mainly of correspondence from Ramsay Crooks, later president of the American Fur Company, to John Jacob Astor and various others, who were employed by or who furnished goods to this company, and from Robert Stuart, agent of the American Fur Company at Michilimackinac.

And again on July 21, 1817:

All the people of Lake Superior have come out and, with a few exceptions, from almost every quarter. In the aggregate the returns are bad.

Selkirk's emissary, in addition to the destruction of our adventure to Red Lake, did us a most serious injury in sending Messrs. Morrison and Roussain prisoners to Fort William last fall * * * (afterwards returned to their posts). Selkirk sent into that quarter last fall at different times not less than 12 canoes and 50 men * * * and, without scruple, introduced the goods which opposed us in the whole department of Fond du Lac, never finding it convenient to consult the collector of the customs or the agent of Indian affairs. * * *

We have, however, had the good fortune to thwart most completely his ungenerous designs. * * *

Settlement with Lord Selkirk for the seizure of certain property and employees was later made, and the Hudson's Bay Company withdrew its operations to the boundary. The American Fur Company did not consider extending its posts to the boundary frontier until 1821, and these posts were not established until the following year. On September 1, 1821, Crooks writes to Mr. William W. Matthews, of Montreal:

I should like to get a couple of good traders for the Rainy Lake department, and wish you would be on the lookout; should good people for that quarter be found, it must be known early, as we would order goods accordingly, and these people might in Montreal wait the arrival of the English goods.

On November 24, 1821, this company entered into a four-year contract with William Morrison for a salary of $1,400 per annum to oversee their trade in the entire region of northern Minnesota. The contract, written by Crooks, is, in part, as follows:

* * * And in addition that you will regulate and conduct the trade of all such Posts or Places as may be established by the American Fur Company in the Country North of the Fond du Lac Department, say in that region extending from the old Grand Portage on Lake Superior to the Lake of the Woods, or further if required within the limits of the United States * * *

About this time the British Government had taken measures to regulate the fur trade in their dominions, very similar to those already taken by Congress. On November 31, 1821, Crooks writes to Astor relative to this new legislation and to their own extension into the Northwest:

* * * Since the British Government has legislated us out of Canada we shall next year occupy three posts within our lines from the vicinity of Rainy Lake to the Lake of the Woods. These are the remotest posts we can have on the north, and although we shall come in contact with the Hudson Bay folks along the boundary, the best hunting grounds are on the American side. * * *

Further, in regard to the supplies for the new territory, Crooks writes to Robert Stuart, the agent at Mackinac, on December 5, 1821:

Morrison will next year establish the Rainy Lake country and carry our trade as near as practicable to the boundary line. To do this effectually he is to get a Mr. McGillis, and he will make the necessary arrangements.

And on April 8, 1822, Crooks again writes Stuart:

You are already aware that Morrison will establish some new posts along our northwestern border. The old Grand Portage is allowed to be within our line, and there the N. W. have always had a good little post, since they retired to Fort William. An outfit from the Fond du Lac department should be sent to that place under some active man; and in order to keep our opponents on their own side of the boundary, our clerks or traders are to be made customhouse officers, and as an additional security against the interfering with our Indians, the new station should be located as far from the boundary line as may be possible, having a due regard to the interest of the trade; and this will lessen the temptation which the rum of our adversaries would always be sure to create were our houses so near to theirs.

The liquor problem mentioned in the last letter proved to be a stumbling-block in the way of the whole undertaking of the American Fur Company in the Lake of the Woods region. The American traders were allowed to take no liquor whatever to the Indian country, while the Hudson's Bay Company with liquor were enabled to draw the Indians to the boundary and buy up their excess provisions, which resulted in literal starvation for the American posts along the boundary. In July, 1822, Stuart requests from George Boyd, the agent for Indian affairs at Mackinac, the right to import liquor into the Indian country for the particular use of the boundary trade in the Lake of the Woods territory.

During the early part of 1823 the American Fur Company and the Stone Bostwick Company combined, still keeping the old name. In writing to Mr. Stone relative to the state of their trade in the Northwest, Mr. Stuart brings up again the liquor question. He says:

But as at each post (say three in number) we come in immediate contact with the Hudson Bay Company we find it will be impossible to oppose them successfully without having some liquor—last year our people were almost starved out and had to carry provisions from the interior posts, at least 500 miles, on dog trains—& all this in consequence of the H. B. Co. purchasing with whiskey what provisions the Indians could spare; as there is no remedy at present for the evil (for the British Co. come over to the line & draw over the Indians), I am confident Gov. Cass will at once relieve us, by giving permission to carry in say 20 barrels whiskey; & you may give him any pledge he may require that a single drop of it shall not be used elsewhere; both Col. Boyd and Mr. Schoolcraft would I am satisfied see the propriety of this, & be inclined to grant our request, but they might be averse to taking the responsibility * * *

The agent for Indian affairs, Major George Boyd, in July, 1824, granted a permit to Wm. A. Aitkin to take two barrels of liquor into the Indian country for use in the extreme northwestern frontier. The permit was never renewed.

Of the three posts of the American Fur Company, that at the mouth of Rainy Lake is the only one definitely located, although as elsewhere stated there seems to have been one at the mouth of Warroad River. The Indians have a tradition that on the Namakan River, which was at that time regarded as the boundary line, the

American Fur Company maintained a small post on one side and the Hudson's Bay Company a post on the other.

When the matter of adjustment of affairs previous to consolidation with the Stone Bostwick Company in 1823 came up, it was conceded that the three northern posts, under conditions existing at that time, had little value. In fact the American traders began more and more to look to the south and west and to the Pacific region. In regard to the extensions in that direction, Crooks writes to Stuart on April 8, 1822:

* * * For the South and West will eventually be our chief dependence and we had better prosecute that trade with vigor, before the door is closed against us by the enterprise and permanent arrangements now about to be matured by other adventurers.

The date of abandonment of these American posts in the Lake of the Woods region is not known with certainty. In the minutes of the council of the Hudson's Bay Company, held at the Red River settlement in June, 1833, the following appears:

That the sum of Three Hundred Pounds Stg. be paid by draft on the Governor and Committee to Wm. A. Aitkin, Esqre.; the American Fur Company having withdrawn during the past Outfit from the frontier of the Lake Superior, Lac la Pluie, Winnipeg and Red River Districts, conformably to the terms of an engagement entered between Governor Simpson and Mr. Aitken, as per correspondence dated Red River, 21st March 1833, the said amount to be charged to the Lac la Pluie District, Ot., 1834.

The same entry is repeated in the annual minutes of the council up to the year 1842. In the minutes of 1839 the name of Ramsay Crooks replaces that of Wm. A. Aitkin; and the minutes of 1840 add the following to the usual vote of £300:

Information having been received through Mr. Keith from Ramsay Crooks, Esq., president of the American Fur Company, intimating the probability of Mr. W. A. Aitkin, establishing a trading post on the borders of Lac la Pluie district, near Vermilion Lake, with a view of carrying on a trade with the natives of that quarter, and Mr. Crooks, having requested permission to oppose Mr. Aitkin in order to restrain his encroachments upon the trade of Lac la Pluie district, it is resolved, that Mr. Crooks be requested to oppose him accordingly; that Chief Factor McDonnell be instructed to make the necessary arrangements for meeting the expected opposition with vigor; and that any additional supplies in men and goods required for that purpose be furnished him from Red River by C. F. Finlayson.[1]

Keating, in his Narrative,[2] mentions a post of the American Fur Company on the south side of Rainy River, at or near the site of the present town of International Falls. He learned from the agent that the American Fur Company carried on a trade between Rainy Lake and Fond du Lac, by way of the Grand Fork, Little Lake Winnipeek, the Mississippi, Sandy Lake, Savannah River, and the river

[1] Oliver, The Canadian North-West, pp. 716, 732, 765, 781, 805, 822, 858.
[2] Keating, Narrative of an Expedition to the Source of St. Peters River.

St. Louis. Incidentally, it may be noted that in 1819 Lord Selkirk proposed to the American Fur Company that they should establish a trading post "north and east of Lake La Pluie and the Lake of the Woods."

Dr. Bigsby, who made a tour of the Lake of the Woods and Rainy River in 1823, as secretary to the Boundary Commission under Articles VI and VII of the treaty of Ghent, makes a passing reference to the establishment of the American Fur Company, which incidentally throws a certain light on the rivalries of the fur traders. He says:

> Walking out the morning after our arrival (at Fort Frances) with Mr. W. McGillivray, the lieutenant governor, I saw on the opposite side of the river some buildings, and a tall, shabby-looking man angling near the falls. I asked my companion what all that meant. He replied, "The two or three houses you see form a fur-trading post of John Jacob Astor, the great merchant of New York. The man is one of his agents. He is fishing for a dinner. If he catch nothing, he will not dine. He and his party are contending with us for the Indian trade. We are starving them out, and have nearly succeeded."

Bigsby adds this dry comment:

> The expedients for preventing a rival from entering a rich fur country are sometimes decisive. Every animal is advisedly exterminated and the district is ruined for years.[1]

The establishment of the North West Company on Rainy River was the scene of one of the minor conflicts between the company and Lord Selkirk, growing out of the rivalries between the Hudson's Bay Company and the North West Company, and the establishment of Selkirk's settlement on the Red River.

In 1816 Selkirk sent one of his agents named Fiddler with an armed party to seize Rainy Lake Fort. Dease, who was in charge of the post for the North West Company, managed to beat off the attack. Fiddler returned to Selkirk at Fort William, and the latter then sent d'Orsonnens, an officer of the disbanded Swiss regiment, a portion of which he had brought west with him from Montreal, with a strong force of men and two fieldpieces to capture the post, which they had no difficulty in doing. In the winter of the following year Lord Selkirk's band of De Meurons, in order to outflank the men of the North West Company, crossed over to the Red River from the Lake of the Woods, probably from some point on Buffalo Bay, and reached Pembina. They came down Red River, surprised the Nor'-westers, and captured their post Fort Douglas.

It does not appear that the North West Company established any trading posts on the Lake of the Woods. The first posts built on the lake subsequent to the establishment of Fort St. Charles were those of the Hudson's Bay Company at Rat Portage, known at one time as Rat

[1] The Shoe and Canoe, Vol. II, 273.

Portage House, and of the American Fur Company at the mouth of Warroad River. When Rat Portage House was first established it is impossible to say with our present information. There may have been a temporary post there as early as 1823, but if so it is curious that neither Mr. Keating nor Dr. Bigsby makes any reference to it. Paul Kane, however, mentions it in 1845 and in 1846.

"We next made the Rat Portage," he says, "at the foot of which is the fort, a small establishment where they were so badly supplied with provisions as to be able to afford us only two whitefish."

On his return journey he says, "arrived at Rat Portage where we were received by Mr. McKenzie with the greatest hospitality and kindness."[1]

Captain Palliser says in 1857:

> On the left bank of the river, opposite to where the portage path terminates, there is a small temporary trading post of the Hudson's Bay Company.[2]

Henry Youle Hind, writing the same year, describes the fort as, * * * "beautifully situated on an island at one outlet of the Lake of the Woods. It is surrounded with hills about 200 feet high, and near it some tall white and red pine, the remains of an ancient forest, are standing amidst a vigorous second growth."[3]

Dr. Robert Bell, for many years an officer of the Geological Survey of Canada, writes:[4]

> I was at Rat Portage in 1872. The H. B. Co.'s post was all that there was of it then. It consisted of two one-story log shanties, a sales shop, and a dwelling. They stood on the west side of what afterwards became the first and main street of Rat Portage. The shanties were at the same spot till 1882, when they were burned, and the company moved across the street and a little farther south. By 1881 they had been replaced by clapboarded buildings, or the log ones had been clapboarded and built higher. * * * My visit in 1872 was made when I came up the Winnipeg River and passed into the Northwest Angle. The place was then a little outpost of the company with a small stock of goods for the Indian trade. The only clearing was the little place between the canoe-landing and the shanties. All around was unbroken forest. In 1826 there might have been a post at the western outlet, but I have never heard so.

Alexander Matheson, at one time a factor in the service of the Hudson's Bay Company, says that "the old post was situated on an island a short distance below the falls at the eastern outlet of Lake of the Woods, and relics in the shape of parts of clay chimneys, etc., were to be seen there a few years ago. The Portage du Rat proper is west of the Western Outlet, at the place where Dick Banning and Company's sawmill is. The site of the old post is now known as Millers Island, and is nearly opposite the Rat Portage electric works."

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[1] Kane, Wanderings of an Artist, p. 447.

[2] Palliser, Journals, Reports, and Observations Relative to the Exploration of British North America, p. 34.

[3] Hind, Narrative of the Red River Expedition, p. 107.

[4] Ontario Bureau of Mines Report, 1895, pp. 169–170.

a, RAT PORTAGE IN 1857.

b, KETTLE FALLS, 1857.

This identification of the old post is confirmed by R. J. K. Pither, for some years an employee of the Hudson's Bay Company, later an agent of the Indian Department of Canada, and now living in his extreme old age at Kenora.

Mr. Archibald Blue, from whose valuable narrative of his Tour of Inspection Through Northwestern Ontario (Ontario Bureau of Mines Report, 1895), the above is taken, has this to say in regard to the three outlets of the Lake of the Woods:

> There are three outlets from the lake which unite below to form the Winnipeg River—one near the west side, a small stream, now called Keewatin Channel, where Keewatin village stands; one near the east side of the lake, close to the modern town of Rat Portage, called the east branch of the river, on which is the beautiful Hebes Falls; and the third and largest in the middle, called the west branch, on which is the Witch's Cauldron, and the great dam recently completed by the Keewatin Power Company. The village of Norman, built on the island between the middle and western outlets, is now part of Rat Portage town, having been incorporated with it in 1892, but Keewatin has maintained an independent existence. On the old maps Portage du Rat is shown to be near the western channel. Upon the left bank of the middle channel there is to be seen an old trail, now grown up with bushes; but the portage at present in use by the Indians is on the right bank of the eastern channel.

Very little is known of the establishment of the American Fur Company at the mouth of Warroad River. Henry R. Schoolcraft, who was Indian agent for the United States Government at Sault Ste. Marie for several years, has the following in a report on trading posts in his agency, dated August 9, 1824:

> Pursuant to instructions, I have determined on the following places where trade may be carried on with the different bands of Indians within the limits of this agency * * * 18. At Rainy Lake. 19. At War Road * * *

It appears from the schedule to the deed of surrender from the Hudson's Bay Company to the Crown in 1869, when Canada assumed jurisdiction over what was known as Ruperts Land, that the company at that time had the following trading posts in the Lake La Pluie district, extending from the mouth of Winnipeg River to Rainy Lake: Fort Alexander, English River, Eagles Nest, Lac du Bonnet, Rat Portage, Whitefish Lake, Trout Lake, Lake of the Woods, Shoal Lake, Big Island, Clearwater Lake, Sandy Point, Hungry Hall, and Fort Frances.

By the deed of surrender certain small areas of land around these posts were reserved to the company. In 1872, at the request of the company, an order in council was passed by the Dominion Government allowing the company to select additional areas at Rat Portage and Fort Frances. For some reason the patent did not issue at the time, and it was not until 1888 that the government of Ontario, which in the interval had obtained jurisdiction over these lands as

part of the territory of the Province, issued a patent for the reserve at Rat Portage to the company.

In 1875 the Dominion Government leased a number of islands in the Lake of the Woods to certain lumber interests in Winnipeg for a period of 21 years. The lease reads:

> All the islands in the Lake of the Woods lying north of the steamboat channel leading into the Northwest Angle of said lake, including the islands in White Fish Bay, together with 18 square miles on the main shore.

In 1891 it was found desirable to resume possession of these islands, and, in view of the surrender of their lease, the lessees were granted Tunnel Island and the water power at the western outlet of the Lake of the Woods. The later history of this water power will be dealt with in another chapter.

Anyone unfamiliar with the history of the Lake of the Woods region might get the impression from a reading of this as well as the succeeding chapters that a disproportionate amount of space has been given to the part Canadians had taken in the exploration of the region; but, as a matter of fact, the explorers, fur traders, missionaries, and travelers who traversed these waters were in nearly every case Canadian. The region was discovered by Canadians during the old French régime, and there were obvious reasons why in later years men of the same nation should follow. The water routes from Lake Superior to the west furnished the only practicable thoroughfares between what was then Canada and the great western plains. On the other hand, the Lake of the Woods region lay well outside the recognized routes from the Eastern States to the trans-Mississippi regions. Consequently until comparatively recent times—in fact, until the beginning of the period of settlement—few Americans penetrated to this remote corner of the United States.

NORTHWEST ANGLE SURVEY

III.—BOUNDARY QUESTIONS.

The first appearance of the Lake of the Woods in diplomatic history is in the preliminary treaty of 1782, signed at Paris on November 30 of that year by Richard Oswald, on the part of Great Britain, and by John Adams, Benjamin Franklin, John Jay, and Henry Laurens on behalf of the United States. Article II relates to the boundaries between the United States and British North America, and describes the western portion of the boundary as follows:

> Thence through Lake Superior, northwest of the Isles Royal and Phelipeaux, to the Long Lake and the water communication between it and the Lake of the Woods, to the said Lake of the Woods; thence through the said lake to the most northwestern point thereof, and from thence, on a due west course, to the River Mississippi.

The definitive treaty of peace, commonly known as the treaty of Paris, was signed at Paris, September 3, 1783, by John Adams, Benjamin Franklin, and John Jay, on the part of the United States, and by David Hartley, on the part of Great Britain. Article II of this treaty is identical with Article II of the preliminary treaty.

The negotiators of the treaty relied for geographical information upon Mitchell's map of North America, 1755. This was the least inaccurate printed map available at the time, although that was not saying much. A great deal of the country dealt with in the treaty was unexplored, and it was subsequently found that Mitchell's map, particularly so far as the West was concerned, was very far from accurate. It is now known that much more reliable manuscript maps existed in 1782, but these were unknown to the negotiators, or at any rate were not used. It was not, however, until 1797 that the fact was absolutely established that the boundary proposed by the treaty of peace from the northwestern point of the Lake of the Woods "on a due west course to the River Mississippi" was a geographical impossibility.

In a manuscript document signed by David Thompson, for many years astronomer of the North West Company and afterwards astronomer and surveyor for Great Britain under the sixth and seventh articles of the treaty of Ghent, he says:

> At the time of the treaty, 1783, the northwest point of the Lake of the Woods was supposed to lie in about 50° of north latitude and the head of the Mississippi somewhat farther north. * * * In the spring of 1797, I was on the headwaters of the Mississippi, and by astronomical observations determined its head to be in the latitude and longitude laid down in the map, making a difference of 2° and 20′ more south than the northwest point of the Lake of the Woods.

In November, 1794, the treaty known as the Jay treaty was concluded. Article IV reads as follows:

> Whereas it is uncertain whether the River Mississippi extends so far to the northward as to be intersected by a line to be drawn due west from the Lake of the Woods in the manner mentioned in the treaty of peace between His Majesty and the United States, it is agreed that measures shall be taken in concert between His Majesty's Government in America and the Government of the United States for making a joint survey of the said river from 1° of latitude below the falls of St. Anthony to the principal source or sources of the said river, and also of the parts adjacent thereto; and that if on the result of such survey it should appear that the said river would not be intersected by such a line as is above mentioned the two parties will thereupon proceed, by amicable negotiation, to regulate the boundary line in that quarter, as well as all other points to be adjusted between the said parties, according to justice and mutual convenience, and in conformity to the intent of the said treaty.

This survey was not made; David Thompson, as already mentioned, having definitely determined that the source of the Mississippi was over 2° south of the northwest angle.

The lack of knowledge, even among those best informed, as to the country west of the Lake of the Woods may be judged from the following official instructions sent by the British Admiralty to Captain George Vancouver on March 8, 1791:

> You are hereby required and directed to pay a particular attention to the examination of the supposed straits of Juan de Fuca, said to be situated between 48 and 49 degrees north latitude, and to lead to an opening through which the sloop *Washington* is reported to have passed in 1789, and to have come out again to the northward of Nootka. The discovery of a near communication between any such sea or strait, and any river running into or from the Lake of the Woods, would be particularly useful.

In a letter dated June 8, 1802, Madison wrote Rufus King, then minister for the United States at the Court of St. James, commissioning him to enter into negotiations for the adjustment of the boundary, and suggesting "a line running from the source of the Mississippi which is nearest the Lake of the Woods and skirting it westward on a tangent, and from the point touched along the watermark of the lake to its most northwestern point at which it will meet the line running through the lake." The matter was taken up with Lord Hawkesbury, and he and Mr. King reached an agreement that the boundary should be the "shortest line which can be drawn between the northwestern point of the Lake of the Woods and the source of the Mississippi."

In 1803 the King-Hawkesbury convention was arranged. Article II of this convention, following, except in its concluding statement, the language of Article IV of the Jay treaty, provided that "whereas it is uncertain whether the river Mississippi extends so far to the northward as to be intersected by a line drawn due west from the

Lake of the Woods * * * it is agreed that * * * the boundary of the United States in this quarter shall * * * be the shortest line which can be drawn between the northwest point of the Lake of the Woods and the nearest source of the River Mississippi." Nothing came of this at the time because of the refusal of the United States Senate to ratify the fifth article. The United States had a few weeks before acquired Louisiana from France, and the Senate feared that Article V of the Hawkesbury-King convention, if assented to, might adversely affect the rights acquired under the Louisiana treaty.

Monroe, in a communication dated September 5, 1804, reviewed the negotiations in connection with the boundary, and set forth the views of the United States as to the inadmissibility of the proposed boundary from the northwest point of the Lake of the Woods to the nearest source of the Mississippi. This line, it was now known, would necessarily run south of the forty-ninth degree of north latitude. Monroe stated that commissaires appointed under Article X of the treaty of Utrecht, 1713, had "fixed the northern boundary of Canada and Louisiana by a line beginning on the Atlantic at a cape or promontory in 58° 30′ north latitude, thence southwestwardly to the Lake Mistassim, thence further southwest to the latitude 49° north from the equator, and along that line indefinitely;" that France by the Louisiana treaty had ceded the western territory up to latitude 49° to the United States, and that, consequently, the line proposed by the Hawkesbury-King convention would run through the territory of the United States.

The accuracy of the statement that the commissioners, under the treaty of Utrecht, had settled the boundary was afterwards challenged by Greenhow in the Washington *Globe*, January 15, 1840, and later in his *History of Oregon and California*. It would appear also from a memoir of the Comte de la Galissonnière on the French colonies in North America, dated December, 1750; from the private instructions to the Marquis de Vaudreuil, dated April 1, 1755; and from a statement by the Duc de Choiseul in 1761, that the commissioners never reached any agreement, and that the question was still in dispute when France ceded Canada to Great Britain.[1]

Whether or not the commissioners under the treaty of Utrecht fixed latitude 49° as the boundary between the western territories of England and France, there is no doubt that the British commissioners contended for the forty-ninth parallel as the southern boundary of British territory.

After the conclusion of the treaty of amity and commerce of December 31, 1806, the British negotiators proposed a supplementary

[1] See also White's Boundary Disputes and Treaties, pp. 886–891.

convention defining the boundary from the northwest angle of the Lake of the Woods. They proposed that it be drawn due south to the forty-ninth parallel and thence due west "as far as the territories of the United States extend in that quarter." The latter words were subsequently changed, to meet the objections of the American commissioners, to "as far as their respective territories extend in that quarter." The treaty, however, fell through and with it the boundary convention.

Under the terms of the treaty of Ghent, signed December 24, 1814, on the conclusion of the War of 1812–1814, provision was made for the appointment of commissioners to determine the boundary "from the water communication between Lake Huron and Lake Superior, to the most northwestern point of the Lake of the Woods." Much controversy followed as to the identity of "Long Lake," and the course the boundary should take from Lake Superior to the Lake of the Woods, but that need not be gone into here. The respective claims set up by Barclay and Porter, the British and United States commissioners, will be found fully set forth in James White's Boundary Disputes and Treaties (in *Canada and its Provinces*). The commissioners were in agreement respecting the boundary from Rainy Lake to the Lake of the Woods, and defined it as passing through the middle of Rainy Lake to its sortie, thence down the middle of Rainy River to the Lake of the Woods, thence northwesterly and westerly to the head of a bay "being the most northwestern point of the Lake of the Woods" in latitude 49° 23′ 55″ N. and longitude 95° 14′ 38″ W.

In negotiating the London convention of 1818, Gallatin and Rush, who represented the United States, proposed the forty-ninth parallel as the boundary from the Lake of the Woods to the Pacific. The British negotiators, Robinson and Goulburn, thought the far western boundary should follow the Columbia River to its mouth. They later suggested the forty-ninth parallel from the Lake of the Woods to the Rocky Mountains, and that west of the mountains the country between the forty-fifth and forty-ninth parallels should be free and open to the citizens of both countries. This was subsequently modified so that all the country west of the mountains claimed by either nation should be free and open for ten years to the vessels, citizens, and subjects of the two powers.

Article II of the treaty of 1818, as finally ratified, reads as follows:

> It is agreed that a line drawn from the most northwestern point of the Lake of the Woods, along the forty-ninth parallel of north latitude, or, if the said point shall not be in the forty-ninth parallel of north latitude, then, that a line drawn from the said point due north or south, as the case may be, until the said line shall intersect the said parallel of north latitude, and from the point of such intersection due west along and with the said parallel, shall

be the line of demarcation between the territories of His Britannic Majesty and those of the United States, and that the said line shall form the southern boundary of the said territories of His Britannic Majesty and the northern boundary of the territories of the United States, from the Lake of the Woods to the Stony Mountains.

It having been finally determined that the forty-ninth parallel was south of the Northwest Angle of the Lake of the Woods, Article II of the Webster-Ashburton treaty of 1842 provided that the boundary line should run along the line already traced by the commissioners of the two countries from Chaudiere Falls, at the outlet of Rainy Lake, to the "most northwestern point of the Lake of the Woods, being in latitude 49° 23′ 55″ north and in longitude 95° 14′ 38″ west from the observatory of Greenwich; thence, according to the existing treaties, due south to its intersection with the forty-ninth parallel of north latitude, and along that parallel to the Rocky Mountains; it being understood that all the water communications and all the usual portages along the line from Lake Superior to the Lake of the Woods, and also Grand Portage from the shore of Lake Superior to the Pigeon River, as now actually used, shall be free and open to the use of the subjects and citizens of both countries."

After many vicissitudes the western boundary had at last been settled as running through the Lake of the Woods to what was known as the Northwest Angle Inlet; from the head of that inlet due south to the forty-ninth parallel; thence west along that parallel. It may be noted, however, that the exact location of the Northwest Angle was not settled without controversy, it having been argued on one side that Rat Portage was the northwesternmost point of the Lake of the Woods and that the boundary should run west from that point, and on the other that the description "northwestern point" was an error, and that the obvious intention was that the boundary should run from the "southwestern point" of the Lake of the Woods, where the forty-ninth parallel strikes the lake.

It appears from a letter of Captain W. J. Twining, chief astronomer of the United States Northern Boundary Commission, dated October 1, 1873, that Dr. I. L. Tiarks, who with David Thompson had been employed in 1825 by the British Government to determine the northwest point of the lake, was actually responsible for determining the location of the Northwest Angle. Tiarks, it is said, had to decide between the angle at Rat Portage and the bay or inlet now known as the Northwest Angle. "This question," says Twining, "was settled by Tiarks in favor of the latter on the principle that the northwest point was that point at which, if the line were drawn in the plane of a great circle, making an angle of 45° with the meridian, such a line would cut no other water of the lake. He therefore determined the relative position of the two points in question by means of their

latitude and longitude; the latitudes were fixed by means of the sextant and the longitude by the mean of several chronometer determinations." Dr. Tiarks's report was adopted at the time by the commission on the part of the United States.

But, although the position of the Northwest Angle had been decided upon, the question was still very far from being finally settled. The point fixed by Tiarks and Thompson as the northwest point of the Lake of the Woods was found to be in a swamp, and its position was given by certain courses and distances from a reference monument. The monument was described by Thompson as a "square monument of logs, 12 feet high by 7 feet square, the lower part of oak, the upper part of aspen." Its latitude was given by Tiarks as 49° 23′ 06.48″ north and its longitude approximately 95° 14′ 38″ west from Greenwich.

Because of some uncertainty as to the true position of the forty-ninth parallel, it was determined in 1872 to survey and mark the boundary from the Lake of the Woods to the Rocky Mountains, and this work was intrusted to an international commission, Captain D. R. Cameron representing Great Britain and Archibald Campbell the United States. In connection with the duties intrusted to them, it became necessary for the commissioners to verify the position of the northwesternmost point of the Lake of the Woods, as fixed by Tiarks and Thompson. In 1872, however, the water of the lake was much higher than it had been in 1825, the site was covered with several feet of water, and nothing remained of the reference monument but a few fragments of the oak foundation. It was only therefore after much search, with the help of Indians, that the remains of the monument were finally discovered by the astronomers of the commission, Captain W. J. Twining and Captain S. Anderson, R. E. The report[1] contains the following interesting account of the old boundary monument of 1824:

> We found at the angle the camp of a surveying party of the British commission in charge of Colonel Forrest, who were engaged in making a survey of the entire northwest arm of the lake, which was afterwards continued along the west shore to the forty-ninth parallel. Colonel Forrest, at various times before our arrival, had sought to discover some trace of the reference monument before alluded to, but his search had been in vain. He had sought information as to its location from the Indians in the vicinity, and elicited to the effect that some of them remembered the visit of the party which erected it, in October, 1824, and that but a few years had elapsed since its total disappearance. They, however, refused to point out the locality which they claimed to know, except upon payment of extravagant rewards to themselves and their tribe. After several powwows with them Colonel Forrest, discrediting their statements, had given up hopes of discovering anything from them and refused to treat further with them. Colonel Forrest stated to me that some Indians had brought to his camp a portion of an oaken log charred and much decayed, which

[1] Reports Upon the Survey of the Boundary * * * from the Lake of the Woods to the Summit of the Rocky Mountains. Washington, 1878, pp. 80–81.

ROUTE OF EXPEDITIONARY FORCE, 1870.

they averred was a portion of the center post of the old monument. As before, they refused to say where they had gotten it, unless their preposterous demands were complied with, and carried it away with them when they found they were not to obtain the compensation sought.

It is not necessary to seek for reasons which would explain the disappearance, in the course of 48 years, of a wooden post surrounded by a cribwork of logs.

First, it was in a locality frequently visited by Indians, whose habits of wanton destruction are well known; second, the locality in question had been ravaged by forest fires; third, natural decay, which was hastened by the fact, as will hereafter appear, of its being much in the water. We had as data for our search the map of the commissioners of 1825, on which were marked the positions of the reference monument, the "most northwestern point" and the place where the astronomical observations were made. We had given also the latitude and longitude of the most northwestern point, and the courses and distances connecting this point with the reference monument.

The official map was, however, drawn to so small a scale (2 inches to 1 mile) that details of localities, such as the most northwestern point, etc., were not recognizable; but the points of land marked "monument" and "observatory" were distinguished, and in the vicinity of the former point thorough search was made for some trace of the monument by Major Farquhar, Captain Anderson, and myself, assisted by the men of our respective parties. This proving unsuccessful, it become necessary to await the completion of Colonel Forrest's detailed survey. During this interval I verified this survey by independent observations for azimuth and by rerunning the transit lines upon the northwestern shore of the bay and resurveying in vicinity of the point of land marked "observatory" on the official map. Separate plats having been made and found in agreement, several points in latitude 49° 23′ 55″ (official latitude of most northwestern point) were platted from latitudes obtained by sextant observations, and from them were platted the official courses and distances to the reference monument. Failing to obtain by this means any trace of the exact site of the monument, as was supposed on account of the probable discrepancy which would reasonably exist between the official latitude and the latitude derived from our observations, and as the joint commissioners who were to follow us from the Red River had not yet arrived, Major Farquhar directed me to select a point on the tongue of land on which we supposed should be the most northwest point, to erect there a station, make azimuth observations, and begin the cutting of the due-south line. The station, pyramidal, with 20-foot center post, was erected, and the cutting began, but suddenly abandoned for cause as will appear.

Mr. James McKay, then member of Parliament of the Province of Manitoba, and manager for the Dominion Government of the "Dawson Route," arrived at the Northwest Angle and became at once interested in the search for the lost monument site. Mr. McKay is of mixed descent, and speaks with fluency the language of the Ojibways, having spent a large portion of his life among them. On this account, and because of his official position and strong personality, he has much influence with the Indians, and obtained one of the old chiefs, who said he knew the place where the monument had been, to go with him and point it out. Accordingly, the Indian, accompanied by Mr. McKay, Major Farquhar, and Captain Anderson, went in a canoe to the point of land which we had searched over so many times, and directed attention to a place, directly off the point, among the rushes which everywhere fringe the shore, and in about 2½ feet of water, which he said he knew to be the place where the monument had been.

By wading, Major Farquhar discovered what were to him and those accompanying him satisfactory evidences that this was indeed the monument site, and

especially as the description heretofore given proved that it must have been in this immediate vicinity. There were depressions where portions of two logs had evidently been at right angles with each other, and, in the included angle, a cavity such as would have been left by the removal of a log, and whence had probably been taken the log before mentioned as having been brought to Colonel Forrest's camp.

The Indians said that the water surface was, at the time of our visit to the Angle, 8 feet higher than it was at the time the monument was erected, and this statement was partially substantiated by the fact that within the knowledge of the white people living at the Angle, there had been no season in which the water had been so high, in the fall of the year. With the water even 4 feet lower this site would have been on "firm ground," as such term would be understood in a country low and swampy, like that in the vicinity of the Angle, and, moreover, in a place very convenient for making the necessary connections with the point marked "observatory" and with the "most northwestern point."

The protocol was signed in London May 29, 1876, on the completion of the work of the joint commission. The northwest point of the Northwest Angle of the Lake of the Woods is shown on the map facing page 83 of the *Reports upon the Survey of the Boundary*, etc., 1878. As already stated, it is a swampy spot, where Minnesota, Manitoba, and Ontario meet, something less than 2 miles from the place where the Dawson Road formerly led over to Red River.

The boundary line, which drops due south from the Northwest Angle, cuts off from Canada about 150 square miles of territory, which constitutes a detached fragment of Minnesota. "Thus it happens," says Dr. Elliott Coues, "that after more than a century of dispute, arbitration, and survey two nations have in and about the Lake of the Woods that politico-geographical curiosity of a boundary that a glance at the map will show, that no one could have foreseen, and that would be inexplicable without some knowledge of the steps in the process by which it was brought about. Either nation could better have afforded to let the boundary run around the south shore of the lake from the mouth of Rainy River to the point where the shore is intersected by the parallel of 49°."[1]

By Article V of the boundary treaty signed at Washington April 11, 1908, provision was made for the reestablishment and marking of the boundary line between Lake Superior and the northwesternmost point of the Lake of the Woods. Under the provisions of the article O. H. Tittman was appointed commissioner on the part of the United States and Dr. W. F. King on the part of Great Britain.[2] The same commissioners were charged with the demarcation and marking of the boundary from the Northwest Angle westward. It is expected that the commissioners will complete their work, so far as the Lake of the Woods is concerned, during the season of 1917.

[1] New Light on the Early History of the Greater North-West, I. 26.

[2] Dr. King died in 1916, and has been succeeded by Mr. J. J. McArthur; Dr. O. H. Tittman has retired and been succeeded by Mr. E. C. Barnard.

IV.—SETTLEMENT.

Settlement in the Lake of the Woods and Rainy River district had its beginnings around the old trading posts of the fur companies. The earliest settlement seems to have been in the neighborhood of Fort Frances, of the Hudson's Bay Company, which, it will be remembered, succeeded La Vérendrye's Fort St. Pierre and Rainy Lake House of the North West Company. About the same time settlement began at the lower end of Rainy River, near Hungry Hall, of the Hudson's Bay Company. From these two points, at either end of Rainy River, it spread very gradually up and down the Canadian side. The earliest settlement on the Lake of the Woods appears to have been in the vicinity of the Hudson's Bay Company's post at Rat Portage. A few years later farmers began to take up land on the south shore of the Lake of the Woods and on Rainy River, in the neighborhood of the old trading post of the American Fur Company, where the town of International Falls now stands; on Zippel Bay; and around the mouth of Warroad River, where the same company is believed to have had another trading post.

The oldest living settler in the Lake of the Woods district is Mr. R. J. N. Pither, of Kenora, who came into this part of the country in a birch-bark canoe in 1846, and has lived there ever since. He was for many years agent of the Hudson's Bay Company at Fort Frances; afterwards agent of the department of Indian affairs of Canada, with headquarters at Pithers Point, near Fort Frances. His home for many years stood a few yards from the site of the old Fort St. Pierre. When he first came into the district it was uninhabited except by Indians and a few fur traders. He has lived to see it developing in every direction, with a number of growing towns on either side of the boundary, and railways running east, west, and south; its waters the source of thriving fisheries; its forests and mines adding yearly to the wealth of two neighboring nations; and its harnessed water powers furnishing the energy for several very important industries.

Mr. Frank Gardner, of Kenora, one of the earliest settlers on the Lake of the Woods, furnishes the following particulars:

My first appearance on the Lake of the Woods was in September, 1875. At that time there were no settlers on any part of the lake. The upper portion of Rainy River on the Canadian side, from the Big Forks to Fort Frances, was sparsely settled, the first men to settle there coming in about 1873 or 1874. In October, 1876, I settled at Keewatin, on the north shore of Lake of the Woods.

At that time I was the only inhabitant. I did a little trading in furs. Work on the Canadian Pacific Railway in that neighborhood started the following spring, and the village of Keewatin had its beginning that same summer. Rat Portage, now Kenora, began about 1879 or 1880. The next settlement was at the mouth of the Warroad River, on the American side of the lake, but I do not remember the year. The Grassy River settlement on the east side of the Lake of the Woods dates from about 1900, and the first settlers on the Northwest Angle came in about the same time.

There is said to have been a small post of the Hudson's Bay Company on the Northwest Angle about 1874 or 1875, somewhere in the neighborhood of old Fort St. Charles.

Mr. W. A. Johnston credits the first impulse to settlement on the Canadian side to the construction of the Canadian Pacific Railway in 1881 as far as Rat Portage, now Kenora, by which better means of communication with the district were established. "At this time," he says,[1] "a number of settlers had already entered Rainy River district and had undertaken farming operations at various points along Rainy River; but for the next 10 years the superior features of the prairies as compared with the densely wooded Rainy River district attracted most of the immigration. In the early nineties many settlers entered the district, coming chiefly from eastern Canada, and most of the land along Rainy River, which was naturally drained or could be readily drained, was taken up. The construction of the Canadian Northern Railway through the district in 1901 gave still further impetus to immigration and industrial development and furnished much needed means of communication and transportation facilities."

Conditions as they were in 1895 have been described by Mr. Archibald Blue in his Tour of Inspection in Northwestern Ontario:[2]

Settlement on the Ontario side (of Rainy River) extends all the way from Fort Frances to the mouth of the river, exclusive of the Indian reserves, and everywhere the soil appears to be uniformly good—a finely silted clay and clay loam, holding a great number of limestone pebbles. All the farmers with whom I spoke are delighted with the country and its suitability for settlement. The lowland, they say, can easily be drained and crops never fail.

Mr. Blue's report also affords some information as to the progress of settlement on the United States side of the river:

A few settlers are coming in on the Minnesota side, and it is expected that the whole river front will be thrown open this year. Surveying parties and timber agents were busy all last summer (1895) getting the territory ready on behalf of the United States Government, and another Oklahoma rush was confidently expected.

Mr. Blue adds in a footnote:

The Red Lake Indian Reservation in Minnesota extends from the mouth of Black River, one of the tributaries of Rainy River, westward to the western

[1] Rainy River District, p. 6.
[2] Ontario Bureau of Mines Report, 1895, pp. 165, 166.

CLEARING HEAVILY TIMBERED LAND.

side of the Lake of the Woods, and contains what is probably the largest body of virgin pine left standing within the bounds of the United States. A large amount of this forest is included in the part of the reservation to be thrown open for settlement. It will not, however, be taken up by settlers, but will be sold at auction. The minimum price of the stumpage is placed at $3 per thousand feet. The reservation was thrown open on the 15th of May of the present year (1896).

At the various hearings some fragmentary information was obtained as to the first settlements around the Lake of the Woods. Mr. W. M. Zippel stated at the 1912 hearings that he had first settled at Rat Portage in 1884. Three years later he crossed over to the south shore and made a home at the mouth of a creek, since known as Zippel Creek. The village that has grown up at this place is also named after Mr. Zippel.

At the 1915 hearing in Warroad, Mr. Alonzo Wheeler stated that he had settled at the mouth of Rainy River, on the Minnesota side, in 1885, and has lived there ever since. The land was then part of an Indian reservation and had not yet been opened for settlement. The place is now known as Wheelers Point.

At the same hearing Mr. Bernard A. Arnesen testified that he had settled at what was then known as Rocky Point, on the south shore of the Lake of the Woods, in 1897. The village that has since grown about his place is known as Arnesen.

Dr. Lawrence Parker, health officer for the township and village of Warroad, stated that he took up his homestead on Warroad River in 1895. The Indians were still in the neighborhood; the land had not yet been opened up for settlement. He squatted there with his family. Dr. Parker mentions that there used to be a small trading post at the mouth of Warroad River in the early days.

Mr. Helec Clementson, who also testified at Warroad, told the commission that he had a farm at the mouth of Rapid River, a tributary of Rainy River on the United States side, and that he had first settled there in May, 1896.

At the Kenora hearing in 1915, Mr. Frank T. Hooper stated that he had settled there in 1875 and had been engaged in the shipping business on the Lake of the Woods since that year.

In regard to the east shore of the Lake of the Woods, Mr. Malcolm McRitchie testified at the Kenora hearing, 1915, that he had settled at Rat Portage in 1883 and had been engaged in the boat business since 1888. He stated that there was a considerable settlement at Grassy River, on the east shore, engaged in farming and lumbering; that, in fact, settlements extended for 25 miles along the east shore.

Mr. Donald H. Currie at the Kenora hearing, 1915, gave the commission the following information in regard to that town: Kenora was incorporated as a town in 1904. There had previously been three

separate settlements near the outlets of the Lake of the Woods known as Keewatin, Norman, and Rat Portage. The name "Kenora" was obtained by taking the first two letters of the three places. The permanent population of the town is about 6,500, to which are added about 3,000 tourists and summer cottagers during the summer months. The total assessment of property in the town is about $3,300,000. Keewatin is a separate incorporated town near Kenora. The industries in the two towns are valued at $3,000,000.

Sandford Fleming, in his "Old to New Westminster," describes Rat Portage as it was in 1883. "Rat Portage," he says, "is beginning to be an important place. * * * Four large sawmills have been constructed here, and immense quantities of lumber have been dispatched to Winnipeg and the country beyond. At present Rat Portage is the watering place for the city of Winnipeg. Gold mining has been commenced. * * * Many explorers are engaged in examining the rocky ledges which crop out on the shore and are exposed on the numerous islands of the Lake of the Woods."

Warroad, Minnesota, was incorporated as a village November 9, 1901. At the Warroad hearings in 1915 some particulars were put in evidence as to the place. The population is now about 1,500. It was 933 in the census of 1910. The taxable valuation of real and personal property is $240,000. Warroad has two banks, with capital stock respectively of $15,000 and $20,000. It is on the main line of the Canadian Northern Railway, and the terminus of a branch of the Great Northern Railway. The town possesses its own municipal electric light plant, water works and sewerage system. Its bonded indebtedness is $37,500.

At the hearing at International Falls in 1915, it was stated that the population of Fort Frances, Ontario, is from 3,000 to 3,500. It contains a number of industries, including large pulp and paper mills. Pithers Point has recently been handed over to the town by the Government of Ontario as a municipal park. Fort Frances was incorporated as a town in 1903.

No information was furnished at the hearings in regard to the town of International Falls. From other sources it appears that it was incorporated as a village in 1912, its first settlement dating back about 25 years. Until a few years ago it was known as Koochiching, the name later applied to the township and county in which International Falls lies. Large pulp and paper mills are also located here.

Other smaller communities on the United States side are Swift, Arnesen, Lude, Concord, Zippel, all on the Lake of the Woods; and Baudette, Spooner, Clementson, Central, Border, Frontier, Birchdale, Manitou, Indus, Loman, Laurel, Pelland, and Ranier, on Rainy River—the last named being situated at the point where the river emerges from Rainy Lake. On the Canadian side of Rainy River are

Rainy River, Rapid River, Sleemans, Pinewood, Stratton, Boucherville, Barwick, Emo, Aylesworth, Big Fork, and Roddick.

Of the land area in the Lake of the Woods region, about 8,500 square miles, or 37 per cent of the total, consists of arable or semi-arable land, most of it, however, requiring drainage. A very small proportion of the total area, consisting mainly of narrow strips along the lakes and rivers, is under cultivation. There is reason to anticipate, however, that much more extensive areas will in time be brought under cultivation. A large part of the most fertile land of America was once covered with forests. Most land that can support heavy growths of deciduous and coniferous trees can also support big crops of other kinds, if properly prepared.

The conditions met in clearing lands for cultivation, and the methods feasible in northern Minnesota, have been discussed by A. J. McGuire in Bulletin 134 of the Agriculture Experiment Station, University of Minnesota. Reference may also be made to Bulletin No. 163 of the same department, containing a report by M. J. Thompson on "Investigations in cost and methods of clearing lands."

In spite of the physical and other difficulties, the comparatively low price of uncleared lands in this region has induced many settlers to locate here and gradually transform their holdings into prosperous farms. Log cabins or small frame houses surrounded by cleared patches along the railways, navigable streams, or main roads, mark the beginnings of agricultural communities. The piles of ties, poles, posts, and cordwood at every railway siding indicate the extent to which the by-products of land clearings are placed upon the market.

In the older communities the difficulties attendant upon settlement in a forested region are not now apparent. Bordering upon the south shore of the Lake of the Woods, and the Canadian bank of Rainy River, are farms which, with their open meadows, groves, and well-kept buildings compare favorably with any other agricultural region of the same latitude. The soil is of lacustrine origin enriched by the humus formed through centuries of forest growth. In certain localities, deposits of a substance resembling marl are found. The small grains yield well where grown, but the acreage is not sufficient to aggregate any large total production. The soil is best fitted for the growth of forage and root crops. The land produces clover abundantly. All root crops, particularly potatoes, carrots, rutabagas, and mangels are productive. On page 47 of the Warroad hearings, September, 1915, Mr. A. M. Landby stated that from 2 acres he had harvested 600 bushels of potatoes. Although not primarily a corn country, the early varieties and fodder corn have been successfully raised in the Lake of the Woods watershed.

The growth of fruit trees here is still in an experimental stage, although the bush fruits do very well.

These forested lands are exceptionally well fitted for dairy farming and stockraising. After clearing from standing timber and brush, excellent pasturage may be provided by seeding down with tame hay, alsike, or clover. By pasturing in this way for several years the stumps and roots become rotten and are removed with much less labor. For these lands the agricultural experimental stations advise the feeding of the general crops on the farm and the marketing of dairy products and stock. By this system the immediate clearing of a large area for crop production becomes unnecessary.

In the swamps tributary to the Lake of the Woods are large areas of peat lands. The manner in which such lands may be profitably utilized has been the subject of much investigation at home and abroad. It has been found that peat soils will produce satisfactory crops of forage plants, small grains, and ordinary vegetables when suitable drainage, cultivation, and proper fertilization are employed, and when climatic conditions are favorable. Professor E. J. Alway[1] discusses very fully the profitable use of these peat lands, and in his experimental work relating to peat soils has taken samples in the Minnesota portion of the Lake of the Woods watershed, at practically all points touched by railways. Relative to the peat soils in general, he states that all are lacking in potash but are well supplied with nitrogen, and that the majority lack phosphates. In regard to the northern edge of Minnesota, he states that the peat soils may generally be depended upon as being of a good character, well supplied with lime. His investigations have shown the large bogs to be particularly well supplied with lime, while the small ones are deficient or commonly termed "sour."

When the peat is from 1 to 2 feet thick it may be farmed as ordinary soil. When deeper than 3 feet it is known as deep peat and must be cultivated and fertilized by proper methods. In certain localities depths of peat up to 12 feet have been obtained. The utilization of peat as a fuel in the Lake of the Woods region is not, however, at present practicable on account of lack of market and competition with coal.

The problems of drainage, roads, and settlement in the Lake of the Woods region are so interrelated that no one of them can be fully discussed without a reference to the other two. Settlement without drainage and passable roads can only take place along the high banks of the streams where for several miles back there is a firm dry subsoil. Drainage is not warranted unless there is a sufficient demand from actual or prospective settlers. Roads can not be constructed

[1] Chief, division of soils, Agricultural Experiment Station, University of Minnesota.

unless means of draining them can be provided at the same time. Drainage is perhaps of primary importance, since now no ditch, in northern Minnesota, at least, is permitted without the formation of a road embankment from one of the spoil banks.

Tributary to the Lake of the Woods and Rainy River there are approximately 3,000 square miles of swamp land. This area is now or in the future will be artificially drained directly or indirectly into the Lake of the Woods. For administration purposes the drainage ditches of Minnesota are divided into three classes, namely, state, judicial, and county ditches. At the present time only judicial and county ditches drain directly into the Lake of the Woods. There are several state ditches on the watershed which drain indirectly into the lake through its tributary streams. The construction of a state ditch is under the supervision of the State Drainage Commission and in accordance with the state drainage laws.

County ditches are built under the supervision of the county commissioners of the county wherein they are located. Judicial ditches are built under the jurisdiction of the judge of the district court, and may or may not be entirely within one county.

Under the Volstead federal drainage law all unentered federal lands and entered federal lands for which no final certificate has been issued are subject to the laws of the state relating to the drainage of swamp or overflowed lands, the same as privately owned lands. Both state and federal owned lands are benefited by the various drainage systems of Minnesota. In homesteading drained federal land the settler assumes the ditch assessment in addition to meeting the homestead requirements. State lands are sold at auction.

The operation of the ditch system of northern Minnesota is not adversely affected by any particular level of the Lake of the Woods. In the final hearings, 1916, pages 374–375, Colonel Mason M. Patrick well stated the effect of any given level of a body of water upon a ditch which enters it on the gradient of the surrounding shore. He said:

> As I understand, the questions have been directed to these witnesses to ascertain what would be the effect upon the system of drainage ditches if the level of the body of water into which they ultimately drain should be placed at any particular elevation, and as to where the silting would take place in the ditches, and what its effect would be.
>
> On the system generally, I think, it goes without saying that wherever a stream of water, whether from a natural channel or from a ditch, enters quiet water, if the flowing stream bears matter in suspension it will be deposited, and that deposit will occur to a greater or less extent, depending upon the amount of suspended matter. If the bottom of the ditch is placed at a particular elevation, and with the assumption that the bed of the still-water lake into which the ditch flows has quite a lengthy slope—that, I do not think, was quite brought out by the witnesses here—the deposit will take place largely in

the still water first, and, as that builds up and checks the flow in the ditch or stream, that will go back until it reaches a point where the fall is sufficient for the water to carry the material farther; but, if the level of the lake itself is raised to any extent whatever, it is merely the transferring of that point of emergence of the flowing stream from one position on the border of the lake at a certain level to another position farther back, and the same state of affairs exists.

Mr. POWELL. Assuming you are following it up from the mouth of the ditch, and you have the level of the bed of the ditch 3 feet above the level of the lake, you start in on the level of the lake and you follow your ditch till the grade carries you 3 feet high; about that point all possible injury to the system above would cease?

Colonel PATRICK. I think you can say that, to the lands lying about that water it would be no detriment—any silting that would take place.

Mr. POWELL. In estimating the damage that would be done to the drainage system, you would confine yourself to that point—whether it be three or four feet or two feet and a half—you would confine yourself to the lowlands between the margin of the lake and that point; that is the only injury that would be done?

Colonel PATRICK. I would like to answer it in this way: That in estimating the damage that would be done to the drainage system, I would consider all damage that was done, but in general terms I would be inclined to believe there would be no damage above that point and all the damage would be to the low-lying land.

Mr. POWELL. Taking into account the damage to the drainage system, you would not consider anything above that system?

Colonel PATRICK. I would not consider it necessary to do so.

The following table gives the drainage statistics relating to county and judicial ditches in northern Minnesota, as presented in the 1913 report of the State Drainage Commission:

County.	Ditches completed or under construction.	Average price paid contractors per cubic yard.	Average cost per acre for land benefited.
	Miles.		
Beltrami	463	$0.14	$1.89
Koochiching	85	.25	1.09
Roseau	147	.14	1.31

Since 1913 the number of drainage projects has increased rapidly, so that the number of miles now completed and under construction would greatly exceed the figures given above.

There is at the present time a network of ditch roads in the northern portions of Beltrami and Koochiching Counties. Similar work is being undertaken on the Canadian side of the boundary. These highways are sometimes impassable for lack of bridges or during wet seasons, but they are being extended and improved each year. In the sparsely settled portions of Minnesota the Elwell road law has been of material assistance. In the practical working out of this law a

DRAINAGE DITCH. SOUTH SHORE.

county is empowered to anticipate the state road and bridge fund which will become available in the future. By issuing bonds, one-half of which are backed up by future state appropriations, one-quarter by assessments upon benefited lands, and one-quarter by the county at large, these counties have undertaken a considerable amount of highway construction. In Koochiching County alone, entirely aside from the ditch roads, 165 miles of road have been constructed in accordance with the Elwell law, under the general supervision of the state highway commission.

One of the most serious problems facing the highway engineer in the Lake of the Woods watershed is drainage. The drainage channels provided for the main roads may be sufficient for them alone, but when the surface water from miles of tributary township roads is at a later date led into them, these channels will prove entirely inadequate. Instead of charging the main road up with a drainage project, the water should be led away from it as much as possible through other channels, so as to allow its subgrade to become dry and firm. Very satisfactory roads may be constructed through peat bogs when these bogs are thoroughly drained. The peat embankment is usually surfaced with a covering of sandy loam or gravel, which gives a firm, stable roadway. In certain localities considerable difficulty is encountered in surfacing clay subgrades on account of the surfacing material mixing with the clay.

Although traversed or skirted by all three of the great Canadian transcontinental railways and connected by branches with the American trunk lines, the Lake of the Woods region, broken up by a network of lakes and rivers, is still dependent to a considerable extent on water transportation, particularly in the more remote districts.

Of the several railways, the Canadian Pacific was first constructed. That portion of the main line between Fort William and Winnipeg was completed in 1882, and has recently been double-tracked. The Canadian Pacific runs north of the watershed for the most part, but touches the Lake of the Woods at Kenora. The Canadian Northern was completed from Port Arthur to Winnipeg in 1901. It runs through the heart of the Lake of the Woods region, crossing Rainy Lake to Fort Frances, thence along the north bank of Rainy River to the town of Rainy River, where it crosses into Minnesota and around the south shore of the Lake of the Woods to Warroad. A few miles northwest of that town it again crosses the international boundary on its way to Winnipeg. The National Transcontinental lies altogether outside the Lake of the Woods watershed, but the main line crosses the Winnipeg River at Minaki, and small steamboats connect Minaki with Kenora. The main line runs from Win-

nipeg to Superior Junction, and a branch from there to Fort William. This portion of the National Transcontinental was completed in 1909.

On the United States side of the watershed a branch of the Great Northern system, built in 1908, connects Warroad with Minneapolis; from International Falls the Minnesota & International Railway, built in 1907, and controlled by the Northern Pacific, runs to Bemidji on the Great Northern; and the Duluth, Rainy Lake & Winnipeg Railway, built in 1907, now owned and operated by the Canadian Northern, connects International Falls with Duluth and Chicago.

V.—WATER SUPPLY AND SANITATION.

Among the purposes mentioned in the official reference are domestic and sanitary purposes. In considering the effect of regulating the level of the lake it was learned that on account of the low elevation of the ground on which the town of Warroad stands any increase in the level would seriously affect the sewerage and water-supply systems of the town. With a view to having an authoritative statement as to the situation at Warroad, the commission authorized its consulting engineers to employ a sanitary engineer, Mr. L. P. Wolff, of St. Paul, Minnesota, to make a complete examination on the ground and report to the commission. Mr. Wolff's report is printed in the 1916 hearings. There will also be found in the same volume two reports of the Minnesota State Board of Health, the first on sewerage and drainage at Warroad and the second on the Warroad water supply. At the various hearings testimony was also obtained from several witnesses on the same questions. The 1915 hearings also contain a certain amount of evidence as to the pollution of Rainy River by refuse from the paper mills at International Falls. This evidence will be found at pages 311, 318–320, and 326–328 of the 1915 hearings.

In regard to the Warroad situation, it may be explained that the town is located on the southwest shore of the Lake of the Woods, at the mouth of the Warroad River. The business portion of the town lies to the north of the river and is built upon ground which has a natural elevation of from 1,066 to 1,068 feet above sea level. The residence district is located on both banks, and practically all buildings are above an elevation of 1,063 sea-level datum. The Warroad Sheet (No. 10) of the south-shore surveys, which appears in the Atlas accompanying the Report of the Consulting Engineers, gives the essential topographic details of its location. From this sheet it will be noticed that back from the north bank of the Warroad River, east of the railway tracks, there is a gradual slope northeasterly to the lake. The entire remaining portion of the town drains directly into the river.

Excavations and well borings indicate that the subsoil formation consists of clay to a considerable depth. With a dense clay such as is found here, and a ground surface from 4 to 6 feet above the general water level, the elevation of the ground water at a distance from the shore, say up to several blocks, undoubtedly is dependent both on

the prevailing lake level and on the degree of saturation of the soil from rains. On the date of the investigation by the State Board of Health water was found standing in the undrained cellar of the State Bank Building, at an elevation of 1,063.25. The lake level on that date was 1,060.3. In another basement, which was drained, the water stood 0.6 feet below the floor, at an elevation of 1,062.5.

In 1914 10-inch sanitary sewers were constructed to serve the business district, and some of the business houses have been connected to them. This sewer empties into Warroad River, as should all future sewers, on account of the proximity and better protection from ice and waves. The sewage from this system passes through a settling tank in which the coarser suspended material is deposited, the effluent passing into a receiving well, from which it is discharged by an ejector through the outlet pipe into the river. The elevation of the invert of the inlet pipe entering the settling tank is 1058, and of the invert of the outlet pipe is 1062.6. Relative to additional sewage disposal into the river the following statement is made in the report of Mr. J. A. Childs, engineer for the Minnesota State Board of Health, on "Sewerage and Drainage at Warroad":[1]

> In addition to the municipal sewer system, several of the residences and other buildings on both sides of the river are provided with private drains and sewers discharging into the river. The municipal water and light plant is provided with a private sewer with an outlet into the Warroad River beneath the Warroad wharf. The public school, district No. 12, Roseau County, is provided with a system which discharges into the Warroad River west of State Street. The sewage from both the water and light plant and the school building is passed through septic tanks. * * *

In his report to the consulting engineers of the commission[2] on the sewage-disposal problem at Warroad, Mr. Wolff stated that in the business district the depth of the main sanitary sewers should not be less than 9.5 feet below the sidewalk grade, and that in residence districts not less than about 6.5 feet below the street grade. These limitations, as Mr. Wolff has stated, would give a free discharge for all untreated sewage at lake elevations of less than 1058 sea-level datum, the elevation of the pipe, which at present discharges the raw sewage into the settling tank. Should the present or any other treatment of the sewage be prescribed the elevation of the final outlet would, without a lift, necessarily be considerably lower than 1058.

From Plate 125, volume of Plates, Report of Consulting Engineers, it is evident that under natural conditions during the past 23 years the level of the Lake of the Woods would have been above 1058 for 25 per cent of the time. In a state of nature, without treating the

[1] Lake of the Woods Hearings, 1916, p. 303.
[2] Idem, p. 297.

WARROAD.

sewage, a lift of varying heads would have been required for one-quarter of the time. If the sewage were treated, the operation of a lift would have been required in a state of nature from 70 to 80 per cent of the time. During the period from 1893 to 1915, the natural levels would have varied within the extreme limits from 1053 to 1061. Within a longer period, the range extended from about 1051 to 1062.5.

In order to avoid the lifting of large quantities of storm water through the sanitary sewer outlets, Mr. Wolff recommends the construction of a separate storm-water sewer for the business district and a system of surface gutters and ditches, following the surface of the ground, for the residence district. The elevation of the invert of the outlet of the storm sewer would be at about elevation 1062, consequently not requiring a lift.

On account of the relatively impervious character of the clay subsoil, drainage of basements to prevent seepage would be necessary under natural conditions as well as under conditions which actually have existed during the past 23 years. As stated before, the level of the ground water is due not only to the lake level but to the precipitation and the upward pressure from underground sources, which results in the flowing wells of this locality. In his report Mr. Wolff has recommended the following solution for the basement-drainage problem:

> In order to prevent seepage of ground water into basements, all basements should be underdrained by placing a layer of gravel or other porous material under the basement floor and laying two or more lines of drain tiles embedded in the gravel. The drain tiles should discharge into a small basin, from which the water should discharge through a trap and back-water valve into the house connection to the sewer. This provision for the removal of ground water is made necessary primarily on account of the lack of surface drainage and the character of the soil, and should be made regardless of whether any regulation of lake levels is adopted or not.

The result, then, of a regulated level higher than the natural level would be to increase the average lift and to a small extent the volume of sewage at the sewer outlets; also, possibly, to cause certain private parties not reached by the sewer to install and operate small lifts of some nature. As far as the sanitary question alone is concerned, any additional installation or operating cost necessitated by a given system of regulation, over and above that required under natural conditions, would be properly chargeable to the project.

A general system for future sanitary sewers covering the entire business and residence districts of Warroad has been outlined in the before-mentioned report. Any additional cost upon future additions due to a proposed system of regulation would be about proportional to that found for the existing system. Assuming a population

of 1,600 and various ordinary maximum levels, the cost of pumping is shown in the following table:

Lake level.	Discharge per day.[1]	Kilowatt hours per annum.	Cost of power per annum.
	Gallons.		
Natural	200,000	8,288	$331.52
Ordinary maximum 1,060.0	200,000	8,979	359.16
Ordinary maximum 1,061.0	220,000	10,636	425.44
Ordinary maximum 1,062.0	240,000	12,432	497.28

[1] The discharge is based upon about 60 gallons per capita per day and a ground-water flow increasing from 100,000 gallons per day at the natural and 1,060 elevation to 140,000 gallons per day at the 1,062 elevation.

The cost figures given in the above table are based upon the replacing of the present inefficient ejector by a centrifugal pump directly connected to a vertical motor. The details relating to the present and recommended lift are presented in Mr. Wolff's report.

In conclusion the report states:

First. On account of the topography and character of the soil the construction of modern buildings with suitable basements will require the installation of an adequate system of sewers and the underdraining of basement floors.

Second. The separate system of sewerage should be adopted, sanitary sewers being provided on all streets, and separate storm-water sewers in the business district, the storm water in other districts being removed by means of open gutters and ditches.

Third. The existing sewers cover only the business district, including Main and Wabasha Streets between Lake and McKenzie Streets, and Lake and McKenzie Streets between Main and Wabasha Streets.

Fourth. The cost of construction of the new sewers west of the railroad, both north and south of the river, will not be appreciably affected by either of the methods of regulating the lake levels considered.

Fifth. The cost of operation and maintenance of the existing sewers will be increased by regulation $70 to $150 per annum, and the cost of operation and maintenance of the new sewers indicated on the map in each of the districts west of the railroad would be increased the same amount.

Sixth. The cost of constructing the 2 miles of new sanitary sewers east of the railroad, indicated on the map, would not be materially increased by regulation.

Seventh. The cost of operating and maintaining these sewers will be increased from $331, with natural lake level, to a maximum of $497, with ordinary maximum at elevation of 1,062.0.

Eighth. Finally, in the determination of a desirable lake level, from the viewpoint of the village of Warroad, will depend largely upon the extent to which the surface may be flooded by extreme high water, rather than upon the cost of installing and operating a system of sewerage.

The report of the Minnesota State Board of Health on the public water supply of Warroad has stated the general conditions as follows:

The public water supply of Warroad is obtained from the Warroad River, approximately half a mile from the point where the river enters the Lake of the Woods. The intake through which the water is pumped extends a

distance of about 3 feet into the river from the river side of the municipal wharf. The intake consists of a 10-inch corrugated culvert, provided with a screen, through which the water flows into an intake well located approximately 16 feet from the shore line.

The pumps, a detailed description of which is given in the above report, are motor driven, the current being furnished by the municipal lighting plant.

In regard to water consumption and the sanitary aspect of the supply, the report goes on to state:

The water is pumped into the distribution system and into a 40,000-gallon elevated steel tank located on a 90-foot steel tower. The distribution system consists of approximately 3,700 to 4,000 feet of water mains. The water is supplied to 14 customers, including the Canadian Northern Railway. The present pumpage is approximately 120,000 gallons per 24 hours. Of this amount the Canadian Northern Railway consumes approximately 80,000 gallons. About 30,000 gallons per day are needed to operate the municipal sewage lift.

The sanitary aspect of this supply is exceedingly poor. The Warroad River is known to be polluted. A sewer carrying the drainage from the pumping station and electric-light plant, in which a water-closet is located, discharges into the river at a point approximately 20 feet above the waterworks intake.

The outlet of the municipal sewer system is located about 200 feet above the intake, on the same side of the river. Farther upstream, on the same side, is the outlet of the schoolhouse sewer. It is stated that water from the public supply is not used for drinking purposes. However, it is supplied to the lavatories in the public school buildings, district No. 12, Roseau County, and to the Warroad Hotel. Small children, not realizing the danger, may drink this water at the school, as may also guests at the Warroad Hotel.

There are three privately owned wells in Warroad, from which, in general, the public obtain their supply of drinking water. One well, which is of the flowing type, has a depth of 110 feet. The second, in which the water rises even with the surface of the ground, is 140 feet deep. The third is a shallow well of 20 feet depth. The field investigations of the Board of Health indicated that these wells, on account of faulty construction at the surface, were open to possible contamination. A more permanent concrete surface construction was recommended.

As to the attempts to obtain a municipal supply from underground sources, the following is quoted:

Attempts have been made to secure a municipal water supply from an underground source. Two 6-inch wells have been drilled a short distance south of the pumping station. The first of these wells was constructed in 1913, and is stated to be 150 feet in depth. The formations encountered in drilling this well were clay, 23 feet, and the balance water-bearing quicksand. The second of these wells, located approximately 12 feet from the first, was constructed in 1914, and is stated to be 251 feet in depth. The formations encountered in drilling this well were as follows: Clay, 23 feet; water-bearing quicksand, 137 feet; water-bearing fine white quartz sand, 40 feet; lignited coal,

12 feet; white quartz sand, 27 feet; blue clay, 12 feet, to the bottom of the well. The water in each of these wells rises to the surface of the ground. Trouble was experienced on account of the filling of the wells with quicksand. On account of the financial conditions of the village no serious attempt has been made to develop the wells.

Relative to the effect of any proposed system of regulation of the levels of the Lake of the Woods, upon the operation and quality of any private or public water supply, the report, in conclusion, states:

1. The field investigation and analytical results indicate the water obtained from the Warroad River to be unsafe for public consumption. They also indicate that a safe water supply can be obtained from underground sources.

2. The maintenance of any of the proposed controlled or regulated levels in the Lake of the Woods, in the opinion of this division, will have no appreciable effect on the operation and maintenance of any of the public or private water supplies or on the sanitary quality of the water. * * *

Because of its relation to the question of the Lake of the Woods levels, something may be properly said here in regard to the application of the Greater Winnipeg Water District for approval of the use of the waters of Shoal Lake for domestic and sanitary purposes. This application was filed with the commission on September 8, 1913. On January 13 and 14, 1914, hearings were held at Washington, at which the witnesses and counsel for all the interested parties were heard. The commission, on January 14, 1914, decided unanimously to grant the application, subject to the following amongst other conditions:

That the water so to be diverted from Shoal Lake and from the Lake of the Woods be not used for other than domestic and sanitary purposes; that the present approval and permission shall in no way interfere with or prejudice the rights, if any, of any person, corporation, or municipality to damages or compensation for any injuries due in whole or in part to the diversion permitted and approved of; and that the quantity of water so taken and diverted shall never at any time exceed 100,000,000 gallons per day: *And provided further*, That the present permission and order shall not be invoked or relied upon in any manner against the recommendations or report to be made by the commission on the reference to it, respecting the levels of the Lake of the Woods, and shall in no way interfere with the action of the commission in that regard.

The project of constructing an aqueduct from Indian Bay, Shoal Lake, to the city of Winnipeg was immediately undertaken. The sill of the aqueduct was placed at 1,050.82 sea-level datum, allowing a flow of 85,000,000 imperial gallons daily at a minimum lake stage of 1,058.19.

Shoal Lake, as a reference to the Atlas will show, is separated from the western shore of the Lake of the Woods by an irregular peninsula. Its outlet into Ptarmigan Bay of the Lake of the Woods is through the Upper and Lower Ash Rapids, which are separated by

a, GREATER WINNIPEG WATER PROJECT.

b, SHOAL LAKE END OF CONDUIT.

Locke Lake, a small body of water approximately 1,600 feet long. These rapids were a considerable hindrance to navigation, which, it is understood, was fairly active following the opening up of mining properties around Shoal Lake. At the present time there is still standing in the channel a pier by means of which at certain water stages boats were pulled up over the rapids. In order to improve the situation the crest of the rock ridge at Ash Rapids was removed in 1912 by the Department of Public Works, Canada, in the interest of navigation. On July 14, 1911, previous to the improvement, the Department of Public Works plans show a fall of 1.2 feet from Shoal Lake to the Lake of the Woods with the latter lake at an elevation of 1,057.3, sea-level datum.

Since the mining days, a certain amount of navigation has been carried on between the two lakes. The early navigators have stated that at times there was a strong current from Shoal Lake into the Lake of the Woods, and that at other times the current was reversed, depending, of course, upon the relative run-off into and outflow from each body of water at the given time.

The area of Shoal Lake is 107 square miles, and the total watershed area, including the lake itself, is approximately 360 square miles. The average annual precipitation to be expected over a long period of years in this locality is approximately 22 inches. Based upon an ultimate draft from Shoal Lake of 85,000,000 imperial gallons daily, or 158 cubic feet per second, an annual run-off of 6 inches from the Shoal Lake watershed would be required to furnish the supply. From the records obtained from similar areas it appears that in years of ordinary or low precipitation, if the full 85,000,000 gallons were used daily, the run-off from the Shoal Lake watershed would not be sufficient. During those times a draft on the Lake of the Woods would be made to supply the deficiency. That the proposed diversion has relatively little effect upon the levels of the Lake of the Woods is evident when it is considered that 85,000,000 imperial gallons daily for one year would require a depth of only 1.42 inches from the Lake of the Woods. Nevertheless, the proposed diversion will ultimately reduce the flow of the Winnipeg River by about 150 c. f. s.

At the time of the application the Greater Winnipeg Water District was composed of the following cities:

	Population.		Population.
Winnipeg	191,067	St. Vital	1,817
St. Boniface	9,100	Kildonan	2,075
Transcona	1,632		
Assiniboia	6,000	Total	214,691
Fort Garry	3,000		

In 1901 the population of this territory was 50,000 inhabitants. By the time the aqueduct is completed it is estimated that 25,000,000 gallons daily will be required to supply from 85 to 100 gallons per capita to 230,000 to 270,000 population. It is evident, then, that the full capacity of the aqueduct will not be utilized for a long time to come. When this time does come, should a period of low water occur, the installation of a small booster pump at the intake could easily lift the balance not supplied at the given level. The provision for an aqueduct capacity of 85,000,000 gallons was, in the opinion of the consulting engineers, providing for as much future growth as the present city could afford to finance.

VI.—AGRICULTURE.

Agriculture in the Lake of the Woods region may be said to have had its aboriginal phase, like most of the other interests dealt with in this report. The Indians who inhabited the region both before and after the coming of the white man did not practice agriculture in anything like the sense that it was practiced by the Mandans and some of the other tribes of the western plains, but they had one crop, which to them was of vital importance, the wild rice (*Zizania aquatica*). These Indians at least could reap where they had not sown, for nature provided the crop, and all they had to do was to gather it in. Of such vital importance to them was, indeed, the possession of their wild-rice fields that it is given as one of the chief causes of the wars between the Chippewa and the Dakota, Foxes, and other tribes. The Chippewa not only depended upon wild rice for their subsistence long before the advent of white traders and explorers, but, according to Jenks,[1] as late as 1900, some 10,000 Chippewa in the United States still gathered it as one of their principal food supplies.

The first mention we find of wild rice in connection with the Lake of the Woods itself is in the memoir of La Vérendrye, dated September 28, 1733, and addressed to the Marquis de Beauharnois, governor of New France. In this, referring to Fort St. Charles, on what is now known as Northwest Angle Inlet,[2] he says:

> Wild oats grow in great quantities, and as the land there is good Sieur de la Véranderie had it burned over to clear it. The wild oats enabled him to save the wheat he had brought, and he will not be obliged in the future to bring any from Missilimakinac.

Elsewhere he says, speaking of the natives about the fort who were starving because of the temporary failure of their fisheries:

> In this extreme need of theirs I made over to them the field of Indian corn which I had sowed in the spring and which was not entirely ripe. Our hired men also got what they could out of it. The savages thanked me greatly for the relief I had thus afforded them. The sowing of a bushel of peas after we had been eating them green for a long time gave us 10 bushels, which I had sown the following spring with some Indian corn. By dint of solicitations I induced two Indian families to sow corn, and I hope that the comfort they derived from it will lead others to follow their example.

These extracts are particularly interesting, not so much in their relation to wild rice as in being the first record of the actual cultivation of the soil in the Lake of the Woods region.

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[1] A. E. Jenks, The Wild-Rice Gatherers of the Upper Lakes. Bureau of American Ethnology Report, 1900.

[2] Journals of La Vérendrye, edited by Lawrence J. Burpee. Champlain Society, Toronto.

Daniel Williams Harmon, whose journal[1] has elsewhere been referred to, notes in connection with his visit to Rainy Lake Fort in the year 1800:

In the vicinity a considerable quantity of wild rice is gathered by the natives, who are Chippeways. This is thought to be nearly as nourishing as the real rice and almost as palatable. The kernel of the former is rather longer than that of the latter and is of a brownish color.

Speaking elsewhere of Rainy Lake and the waters flowing out of it he says:

On the margin of the waters which connect this lake with the Great Winipick Lake, the wild rice is found of which I have spoken on a former occasion. This useful grain is produced in no other part of the northwest country; though Carver erroneously states that it is found everywhere. It grows in water about 2 feet deep where there is a rich muddy bottom. It rises to more than 8 feet above the water, and in appearance bears a considerable resemblance to oats. It is gathered about the latter end of September in the following manner: The natives pass in among it in canoes. Each canoe has in it two persons, one of whom is in each end, with a long, hooked stick in one hand and a straight one in the other. With the hooked stick he brings the heads of grain over the canoe and holds it there while with the other he beats it out. When the canoe is thus sufficiently loaded it is taken to the shore and emptied. This mode of gathering the wild rice is evidently more simple and convenient than that which was practiced in Carver's day. This grain is gathered in such quantities in this region that in ordinary seasons the Northwest Company purchase annually from twelve to fifteen hundred bushels of it from the natives, and it constitutes a principal article of food at the posts in this vicinity.

Alexander Henry[2] stopped at an Indian village at the mouth of Rainy River, on his way to the west in 1775. The Chippewa presented him with provisions, and he in return gave them a present of gunpowder, shot, and a keg of rum.

In a short time the men began to drink, while the women brought me a further and very valuable present of 20 bags of rice. This I returned with goods and rum, and at the same time offered more for an additional quantity of rice. A trade was opened, the women bartering rice while the men were drinking. Before morning I had purchased a hundred bags of nearly a bushel each. Without a large quantity of rice the voyage could not have been prosecuted to its completion. The canoes, as I have already observed, are not large enough to carry provisions, leaving merchandise wholly out of the question. The rice grows in shoal water and the Indians gather it by shaking the ears into their canoes.

Peter Grant who, as elsewhere mentioned, was in charge of the trading post on Rainy River about 1799, says[3] of the river:

Its course runs northwest through a flat country which could be cultivated to advantage; Indian corn, melons, cucumbers, and all our garden vegetables thrive to perfection in its vicinity.

[1] Journal of Voyages and Travels, rep. 1903, p. 19.

[2] Travels and Adventures in Canada and the Indian Territories, p. 242.

[3] "The Sauteux Indians" in Masson's Bourgeois de la Compagnie du Nord-ouest, II, p. 311.

SOUTH SHORE FARM.

Alexander Mackenzie,[1] writing about the same time, says:

> Though the soil at the fort (Rainy Lake) is a stiff clay, there is a garden which unassisted as it is by manure or any particular attention is tolerably productive.

Gabriel Franchère[2] in his overland journey from the mouth of the Columbia to Montreal in 1814, spent a night at Rainy Lake House, where he says, "We saw here cultivated fields and domestic animals such as horses, oxen, cows, etc."

Keating[3] visited the Hudson's Bay Company's post on Rainy River in 1823. "The soil," he says, "is rather light, but in the immediate vicinity of the fort is excellent; potatoes and wheat are cultivated, together with maize, peas, beans, pumpkin, water and muskmelons, etc."

Captain Back,[4] on his way to explore the Arctic coast, also paid a flying visit to the Hudson's Bay Company's post on Rainy River in 1833, and from his narrative we learn that the wild rice crop, generally abundant at this solitary trading establishment, was a failure in that year.

Paul Kane[5] writes that in 1845 a little grain was grown in the vicinity of Fort Frances "this being the first land I had seen fit for agricultural purposes, since I had left Fort William." Threading his way through the innumerable islands of the Lake of the Woods, on his return journey, he says:

> We saw in one of them about 5 acres of cultivated corn, the only instance of the kind I have seen since I left Norway House. There is another island called Garden Island, which lay to the west of our route, about 6 miles long and about 3 wide, on which I was told some Indians raised yearly a few bushels of corn and potatoes.

Captain Huyshe,[6] a member of the military expedition of 1870 against Louis Riel, was, with Colonel Wolseley, the guest of the Hudson's Bay Company's agent at Fort Frances, and in his narrative of the expedition expressed his gratitude to the agent for "allowing us to have the run of our teeth in his garden, so that during our stay of five days we revelled in green peas, young potatoes, and cabbages, most agreeable antidotes to the scorbutic tendencies of salt pork." He adds that the agent "had a few acres of wheat, barley, and Indian corn all of which looked remarkably well; the wheat was ready for the sickle, and the grain fine and full (this was in August). Wheat is sown here about the last week in April, and takes about 90 days

[1] "General History of the Fur Trade," in Voyages from Montreal Through the Continent of North America. XCIV.

[2] Narrative of a Voyage to the Northwest Coast of America, p. 335.

[3] Narrative of an Expedition to the Source of St. Peters River.

[4] Arctic Land Expedition, p. 40.

[5] Wanderings of an Artist Among the Indians of North America, p. 62.

[6] The Red River Expedition, p. 138.

to come to maturity. Potatoes, sown about the 8th of May, were fit for the table when we arrived. There were no pigs, sheep, or fowls, but about 20 head of cattle, 3 of which we bought for the use of the troops."

George M. Grant,[1] in his narrative of Sandford Fleming's expedition overland to the Pacific in 1872, also has something to say about agriculture at Fort Frances:

> A sandy plain of several acres, covered with rich grass, extends around the fort, and wheat, barley, and potatoes are raised; but beyond this plain is marsh and then rock. A few fine cattle, in splendid condition, were found grazing upon the level. On the potato leaves we found the "Colorado Bug," that frightful pest which seems to be moving farther east every year.

Grant was much impressed with the agricultural possibilities of Rainy River. He says:

> The land is a heavy loam, once the bed of the river, and is called "muskeg" here, though, as that is the name usually given to ancient peat bogs, or tamarack swamps abounding in springs, it is not very appropriate. The time will come when every acre of these banks of Rainy River will be waving with grain or producing rich heavy grass for countless herds of cattle.

At the hearings held in 1912, 1915, and 1916 a great deal of testimony was obtained as to the agricultural interests about the shores of the Lake of the Woods and Rainy River, which will be found in the three volumes referred to in preceding chapters. This testimony, together with the two series of affidavits filed in the State Department at Washington by the Lake of the Woods and Rainy Lake River Low Water Association, represent the views of the farmers, particularly on the United States side, as to the extent and value of their lands, the crops raised thereon, and the effect of various stages of water upon their property.

The following particulars are taken from the United States census report, 1910, as to the extent and value of agriculture in the northern counties of Minnesota bordering on the Lake of the Woods and Rainy River:

County.	Approximate land area.	Land in farms.	Improved land in farms.	Value all farm property.	Land value alone.	Population, 1910.
	Acres.	*Acres.*	*Acres.*			
Beltrami	2,446,080	223,764	33,253	$3,389,856	$2,196,169	19,337
Cook	958,720	23,769	1,568	372,166	288,920	1,336
Koochiching	2,010,240	73,245	5,529	1,028,563	734,960	6,431
Lake	1,343,360	22,279	2,381	442,694	252,535	8,011
Roseau	1,068,800	315,106	157,332	6,135,882	3,875,880	11,338
St. Louis	4,161,920	272,995	41,111	6,798,209	4,093,676	163,274

It may be noted that the column of land value refers to the value of all privately owned lands in farms, including both improved and unimproved lands; and that the average value of all farm lands in

[1] Ocean to Ocean, p. 50.

these counties is between $10 and $15 an acre. A comparison of average value with the proportion of the land under cultivation would afford an estimate of the value of such lands. As to the areas, the statement, of course, represents the total acreage in the counties, and bears no relation whatever to the areas of the agricultural lands affected by any stated level in the Lake of the Woods. Similarly, as to agricultural lands on the Canadian side of these international waters, it appears from the published returns of the census of Canada, 1911, that the total area of occupied agricultural land in that portion of the Thunder Bay and Rainy River districts lying within the Lake of the Woods watershed is 268,509 acres. Of this total about 37,250 acres is improved land, the balance unimproved.[1] The population of the region is 38,000.

The evidence as to land values along the south shore of the Lake of the Woods was conflicting. The owners largely fixed the value of their holdings at $100 per acre. It seemed, in some cases at least, that there was considerable sentiment involved in determining the value. Mr. Ralph, the engineer who made land surveys in this district over 20 years ago, stated[2] that these low-lying lands were worth about $60 per acre. Where subject to flooding, however, they had only a nominal value, which he placed offhand at $5 per acre. The testimony of Mr. Holdahl, of Roseau County, who has resided in Roseau, the county seat (about 20 miles west of Warroad), for the past 20 years, and is an agent for the sale of lands, was based upon actual land transactions. He stated:

> There are farms tributary to Roseau with good buildings on that you could not buy for less than $75 per acre. * * * Improved farms, with reasonably good buildings, and cleared, are worth all the way from $50 to $75 per acre. * * * In units of 160 acres, without any buildings, cleared of brush, either partly in hay or under the plow, value of such depends a little on distance from town, but all the way from $15 to $35 per acre.

Mr. Holdahl said his knowledge extends to lands 10 to 15 miles from Roseau. He stated that it costs about $25 to $35 per acre to clear land. His nearest land transaction to Warroad was 17 or 18 miles distant, and it occurred three years ago. The price was $25 per acre. It was the same character of land as about the lake.

> There was not much in the way of buildings on it, probably 75 acres cleared out of the 160 acres * * * land under the plow worth generally from $15 to $35 per acre, with little or no improvements, according to distance from town or market.

Mr. Holdahl also said[3] that some wooded land might yield from 50 to 70 cords of wood per acre. His own experience in clearing

[1] The Census and Statistics Office of Canada states that the average value of these lands is $9.25 an acre.

[2] Public Hearings, 1912, p. 88.

[3] Further Public Hearings, Warroad, 1915, p. 250.

some land was that he had 100 cords. He paid 85 cents for cutting and $1 to haul it to town, with an added charge for delivering it to purchasers of 35 or 40 cents. This wood he sold for $2.50 per cord, which left a profit of about 30 cents per cord. He pointed out that there were extensive state land sales from time to time, the figures obtained varying from $8 to $25 per acre.

An examination of the levels that would have prevailed on the Lake of the Woods during the past 21 years, under natural conditions, indicates that in 7 years the water would have reached 1,059 and over during the growing season. It must be obvious such frequency of flooding would at once seriously affect the value of arable lands below that level; in fact, even above it, as there is the factor of seepage, as well as occasional additional flooding through storms piling up the water along the shores of the lake. Mr. Landby, at the hearings in 1912, when Mr. Ralph was testifying, considered that those lands adjoining the lake could only be farmed which were 2 feet above the lake level. On the basis of other evidence, however, the commission has adopted 1.5 feet as an average measure of the effect of seepage on the lands involved. That would mean that with the levels of the lake as in a state of nature during the past 21 years, the adjoining lands would be occasionally affected by high water up to a contour of 1,061.5, which would reduce their value for farming purposes below that level.

The commission had extensive and exhaustive plane-table surveys made, and classified the land between foot contours below 1,064, and, in some cases, as high as 1,066.

In the following tables an analysis has been made of the character of such portions of those lands below contour 1,064 as are in private ownership:

Private and filed-on lands.

UNITED STATES.

	Area.	Percentage of total area.		Area.	Percentage of total area.
	Acres.			*Acres.*	
Cultivated lands	275.1	2	Coniferous swamp	1,445.4	11
Grass lands	790.9	6	Willows and brush	1,848.7	14
Grass lands with scattered poplars	506.1	4	Open marsh or bog	3,237.0	24
Deciduous trees	3,583.0	26	Land lost through erosion	1,583.1	11
Mixed, deciduous and coniferous	234.3	2	Total	13,503.6	100

CANADA.

Cultivated lands	51.8	1	Coniferous swamp	262.5	6
Grass lands	381.0	8	Willows and brush	819.5	17
Grass lands with scattered poplars	115.1	2½	Open marsh or bog	603.9	13
Deciduous trees	615.8	13	Reconnaissance area [1]	641.0	14
Mixed, deciduous and coniferous	395.1	8½	Lost lands [1]	785.0	17
			Total	4,670.7	100

[1] Chiefly low-grade cultures.

a, NORTH SHORE FARM.

b, A PIONEER'S HOME.

As all affected areas in both countries had to be investigated, some being entirely removed from railway facilities and remote from settlement, the commission, after careful consideration of all factors, fixed the following range of values, viz: Cultivated lands, $75 to $35 per acre; grass lands, $50 to $25 per acre; grass land with scattered poplars, $35 to $15 per acre; lands covered with deciduous trees, $20 to $10 per acre; lands covered with mixed deciduous and coniferous trees, $15 to $5 per acre; coniferous swamp, $5 to $3 per acre; lands covered with willows and brush, $5 to $3 per acre; open marsh or bog, $5 to $1 per acre.

In view of the fact that 1,059 has been computed to be ordinary high water as it would have been in a state of nature during the past 20 years, any lands below 1,058 would obviously have only a nominal value for agricultural purposes. It is interesting to compare the values fixed between 1,058 and 1,064 with actual sales of land in the counties of Beltrami and Roseau, as presented at the Winnipeg hearings by Mr. Laird and filed as Exhibit No. 7.

This exhibit records a list of 110 sales of land in Beltrami County and Roseau County, Minn.

The total acreage and prices comprised in these sales have been summed with results as follows:

Beltrami County.—Thirty-five of the sales cited were made in Beltrami County in 1913, 1914, and 1915, and their totals are:

Area, 5,032.55 acres. Sale price, $39,511.85. Rate per acre, $7.86.

Roseau County.—The remaining 75 sales were of land in Roseau County in 1912, 1913, 1914, and 1915, and their totals are:

Area, 8,543.14 acres. Sale price, $124,347. Rate per acre, $14.55.

The total sales in the two counties combine as follows:

	Area.	Sale price.	Rate per acre.
	Acres.		
Beltrami County	5,032.55	$39,511.85	$7.86
Roseau County	8,543.14	124,347.00	14.55
Total	13,575.69	163,858.85	12.07

Compared with these figures, the valuation of the United States surveyed areas, at tentative rates for privately owned lands, are as follows:

	Area.	Value.	Rate pe acre.
	Acres.		
Atlas sheets 2, 3, 5, 12, 13, 14, 15, Beltrami County	3,276.4	$33,521.25	$10.23
Atlas sheets 9, 10, 11, Roseau County	3,064.9	56,936.90	18.58
Total	6,341.3	90,458.15	14.27

It will be noted that the commission's rates have thus produced area for area, higher results than the prices realized on actual sale.

In order to show that the higher agricultural value of lands in the vicinity of Warroad was not overlooked in the preparation of the table of values, the figures for the Roseau County lands (sheets 9, 10, and 11), the highest valued of all the agricultural lands around the Lake of the Woods, are shown in the following tables:

	Area.	Value.	Rate per acre.
	Acres.		
Atlas sheet 9, Elm Point	787.8	$10,337.30	$13.12
Atlas sheet 10, Warroad	1,325.5	36,345.30	27.42
Atlas sheet 11, Willow Creek	951.6	10,254.30	10.78
Total	3,064.9	56,936.90	18.58

Thus the average price per acre of the land shown on the Warroad sheet—$27.42—is almost double the sale price per acre for Roseau County lands—$14.48. The foregoing comparisons, so far as the Lake of the Woods lands are concerned, and shown on the atlas sheets, are for areas between 1064 and 1058, while the parcels sold are variously situated and generally at higher elevations.

The following table shows United States areas and values, also rates per acre for United States private lands only, between contours 1064 and 1060:

	Area.	Value.	Rate per acre.
	Acres.		
Atlas sheets 2, 3, 5, 12, 13, 14, 15, Beltrami County	2,715.5	$32,046.30	$11.80
Atlas sheets 9, 10, 11, Roseau County	2,536.9	55,289.65	21.80
Total	5,252.4	87,335.95	16.63

	Area.	Value.	Rate per acre.
	Acres.		
Atlas sheet 9, Elm Point	688.5	$10,077.00	$14.62
Atlas sheet 10, Warroad	944.4	35,101.15	37.20
Atlas sheet 11, Willow Creek	904.0	10,111.50	11.18
Total	2,536.9	55,289.65	21.80

VII.—LUMBERING.

While the lumbering industry in northern Minnesota and western Ontario is of comparatively recent growth, many of the early travelers through the Lake of the Woods country drew attention to the extent and variety of the timber resources of the region.

La Vérendrye in his journal, 1732, describes the banks of Rainy River as very beautiful and bordered with groves of oak. Joseph La France, in his Narrative of 1740, speaking of the same river, says that the whole country along its banks is full of fine woods. In going through the Lake of the Woods, he adds, "All these islands and coasts are low and full of fine woods."

Dr. John McLoughlin, of the North West Company, who was in charge of the post on Rainy River about 1800, left a manuscript account of the Indians from Fort William to Lake of the Woods (now in the McGill University Archives, Montreal), in which he says:

> The banks of Rainy Lake River are, in general, high and covered with abundance of elm and oak with immense numbers of wild prune trees, cherry, wild pears, and here and there intersected by small meadows which enhance the appearance of the country a good deal. * * * The trees in these forests are birch, aspine, poplar, elm, bass, tamarac, cedar, white and red pine.

Alexander Henry[1] says that the banks of Rainy Lake, in 1775, were covered with maple and birch. Alexander Mackenzie, in his "General History of the Fur Trade" (1801), says of Rainy River:

> This is one of the finest rivers in the Northwest. * * * Its banks are covered with a rich soil particularly to the north, which in many parts are clothed with fine open groves of oak, with the maple, the pine, and the cedar. The southern bank is not so elevated and displays the maple, the white birch, and the cedar, with the spruce, the alder, and various underwood.

Keating,[2] in his Narrative of the expedition of 1823, says of the Lake of the Woods islands:

> All rest upon solid rock and are covered with small trees, chiefly pine, spruce, hazel, willow, cherry, etc., besides vast quantities of bushes bearing berries.

And of the Rainy River he says:

> The forests are more dense and heavy (than on the Winnipeg River) and contain several trees not enumerated in the foregoing list, viz, white oak, ash, hickory, water maple, white walnut, linden, elm, etc. The pine and white birch become more abundant and attain a more stately size.

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[1] Travels and Adventures, etc., pp. 239, 240.

[2] Voyages from Montreal Through the Continent of North America, p. xciv.

Sir George Simpson[1] in 1841 described Rainy River as resembling the Thames near Richmond:

> From the very brink of the river there rises a gentle slope of greensward, crowned in many places with a plentiful growth of birch, poplar, beech, elm, and oak.

Bishop Taché,[2] who from his long residence in the West, had a wide knowledge of conditions in his day, says (1870):

> The districts of Rainy River, of Lake of the Woods, and of Winnipeg River * * * are well wooded as regards the description of timber, and will be an immense resource for the colony of Assiniboia, where already is felt the want of this remote supply.

Captain W. J. Twining,[3] speaking of the Lake of the Woods country in 1875, says:

> The forests are mostly composed of small pines and tamaracks, though on the higher ground elm, birch, and aspen are found.

So much for the character of the timber resources of the Lake of the Woods district, in the early days before commercial interests began to exploit them. Generally speaking it may be said of the forest growth in recent years that the light drift and bare rock of certain portions of the watershed nourish heavy growths of jack (Banksian), white, and red (Norway) pine, with a scattering of balsam fir and deciduous trees. These trees frequently seem to find root in the rock itself. Where large trees have been blown over it may be observed that the roots are short and stubby, taking on to the minutest detail the shape of the crevice in which they have sought sustenance.

Like all timbered areas, this district has suffered from time to time from the effects of devastating fires. There is a popular impression that forest fires began with the advent of the white man, but this is not supported by the facts. The Indian would naturally be more careful than the inexperienced white man in taking precautions against the spread of fire, but not any more so than the white trapper or trader or anyone else accustomed to living in the open. Many fires have, of course, been occasioned by sparks from locomotives and other modern agencies; but as a matter of fact forest areas would to a certain extent be subject to destruction by fire even if uninhabited by man. Lightning probably accounts for the burning of quite a considerable proportion of timber, particularly in the early days. In any event, it is safe to say that much of the best timber had been destroyed by fire years before lumbering operations commenced either on the American or Canadian side of the Lake of the Woods, Rainy River, and Rainy Lake. Both Governments, recognizing that these driftless areas will never be used for cultivation, have set aside

[1] Journey Around the World, 1841–42. I, p. 46.
[2] Sketch of the North West of America, p. 25.
[3] Reports Upon the Survey of the Boundary, p. 54.

LUMBERING IN NORTHERN MINNESOTA.

liberal reserves for forest preservation and reforestation purposes. A glance at the watershed map prepared by the consulting engineers, and presented in the Atlas, will show the extent and location of the Superior National Forest, the Burntside State Forest of Minnesota, and the Quetico National Forest of Ontario.

As to the available timber on the United States side, the report of the chief fire warden of Minnesota, 1895, contained an estimate of the timber by counties, and in the report of the United States Geological Survey, 1900, a further estimate was made from sources of information then available. Taking the counties that are included in the Lake of the Woods watershed and allowing for the proportion of such counties that are not included therein, the stand of timber, according to the last estimate, is about 7,000,000,000 feet of pine, 18,000,000 cords of pulpwood, and 35,000,000 cords of fuel wood, less the quantities cut or destroyed by fire since 1900. The stands of pine timber are in the northern parts of Cook, Lake, and St. Louis Counties and in the northern part of Itasca County. The spruce stands seem to be mainly in Koochiching County and the northern part of Beltrami County. In 1915 the stand of spruce was estimated at 4,000,000 cords.

As to timber resources on the Canadian side, very little authoritative information is available. The reports of the explorations of the Canadian Geological Survey give no definite information, and what they do afford relates to very restricted areas. The Department of Lands, Forests, and Mines of Ontario, under whose jurisdiction this watershed lies, has made no surveys upon which an estimate can be based. The only thing approaching an estimate is a statement by the late Aubrey White, when Deputy Minister of the department, to the effect that there were about 2,000,000,000 feet of pine in the tract west of Port Arthur and south of the line of the Canadian Pacific Railway, which would correspond roughly with the watershed of the Lake of the Woods.

On the assumption that the condition of the pine forests on the Canadian side as a result of fire and timber operations would not be any worse than on the United States side, Mr. R. H. Campbell, director of forestry of Canada, suggests that the probability is that the area of pine on the Canadian side is very considerably less than on the United States side; in fact, less than half according to his estimate. The proportion of the district that would be mainly covered by spruce would be that much larger, so that the quantity of pulpwood on the Canadian side would in such circumstances be considerably higher, probably double the quantity. Mr. Campbell puts the quantity of pulpwood roughly at from 30,000,000 to 40,000,000 cords. The fuel wood, which would be largely hardwood,

would probably run somewhat less than on the United States side, probably altogether about 20,000,000 to 30,000,000 cords.

Although, as already mentioned, the lumbering industry in northern Minnesota and western Ontario is of comparatively recent growth, yet the timber now available in this region for the manufacture of lumber, wood pulp, etc., like that of other timbered sections in both countries, is being diminished at a rate that will in a comparatively few years practically exhaust the present supply of timber. It is estimated, however, that the extent of merchantable timber now available will enable the lumber industry to continue at substantially its present rate of timber consumption for a period of about 20 years. Pulp-wood timber in this section on both sides is more plentiful, and the areas covered by these forests are far more extensive, while the natural character of the soil and its continued moisture is not only conducive to the rapid growth of the existing timber, but also especially conducive to new growth. It is, therefore, estimated that the existing supply of pulp-wood timber, together with the new growth, will insure the life of the manufacture of wood-pulp paper in this region for a great many years.

The Minnesota forest service has made the following estimates of log driving on the rivers flowing into Rainy River on the United States side alone:

	1908	1909	1910	1911	1912
	Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*
Little Fork	20,000,000	30,000,000	60,000,000	(1)	50,000,000
Big Fork	45,000,000	40,000,000	80,000,000	(1)	100,000,000
Kawishiwi	20,000,000	.....	.....	.....	.....

[1] None.

The principal lumber companies on the United States side are the following: Virginia and Rainy Lake Company, Virginia, Minnesota; International Falls Lumber Company, International Falls, Minnesota; St. Croix Lumber and Manufacturing Company, Winton, Minnesota; Engler Lumber Company, Baudette, Minnesota; Swallow-Hopkins Company, Winton, Minnesota; and the Clementson Mill, Clementson, Minnesota.

The output of the mills has remained fairly constant during the past 10 years. The mills at Virginia anticipate a sufficient supply to maintain their present capacity of 1,000,000 feet per day for about 20 years. The mill at Tower has very nearly reached the end of its supply, while the Winton mills have sufficient tributary timber for only a few years.

On the Canadian side, the following lumber companies operate in the Lake of the Woods and Rainy Lake districts: Rat Portage Lumber Company; Keewatin Lumber Company; Shevlin-Clarke

a, LOG DRIVING, KAWISHIWI RIVER.

b, SHEVLIN-CLARKE MILLS.

Company; Captain Kendall, engaged in business in Kenora; and Captain J. Short, who operates a mill at the same place. The Rat Portage Lumber Company, with head office at Winnipeg, has a capital invested of $1,250,000 in the lumbering industry. From 300 to 400 men are employed in the Lake of the Woods district and 350 in the Rainy Lake district. The boats owned by the company are the *Mary Hatch*, 9 feet draft; *King Fisher*, 8.6 feet draft; *Empress*, 7.6 feet draft, and *Wendigo*, 5.6 feet draft. The Keewatin Lumber Company, with head office at Keewatin, Ontario, has an investment of $1,500,000 in the district. The gross value of the yearly output is $750,000, the output amounting to 30,000,000 b. m. feet of lumber and 300,000 ties annually. The company employs 350 men. It has the following boats in operation: *Mather*, 9.6 feet draft; *Manoka*, 6.6 feet draft; and *Banning*, 7 feet draft. The Shevlin-Clarke Company's plant is located in the town of Fort Frances, Ontario. It employs about 1,200 men and its average monthly pay roll amounts to $75,000.

From a statement furnished by the Department of Lands, Forests and Mines of Ontario, it appears that the total area of timber berths on the Canadian side amounts to something over 1,500 square miles. During the years 1899 to 1914 there were cut on the Canadian side of the watershed, 8,625,951 saw logs containing 397,357,452 feet b. m., 10,042,563 railway ties, and 16,435 cords of pulp wood.

Within the limits of the available funds the Minnesota Forest Service has done a great deal along fire prevention lines. The forested region of the state is divided into ranger districts, of which all or portions of eight districts lie within the Lake of the Woods watershed. A forest ranger has the supervision of each district and temporarily may have from three to ten patrolmen under him. The Federal Forest Service, which has the administration of the Superior National Forest, has cooperated with the State service in propagating a campaign of education in the prevention of forest fires. The various railroads have also taken the matter up with their employees. The result of such a campaign, although not disposing of forest fires entirely, will greatly diminish them. For the purpose of detecting fires, a series of lookout towers have been constructed on various physical prominences. These towers, with the telephone lines of the Forest Service, are of great assistance in locating and extinguishing blazes which would spread into larger fires.

During the past 10 years, there have been two forest fires of great magnitude on or touching the watershed. Of these, the Baudette fire of October, 1910, caused the heaviest loss in human life. The Baudette fire extended from Baudette and Spooner westward, taking in some territory in Ontario. The towns of Baudette and Spooner

were wiped out entirely, 300,000 acres of land were burned over, and 42 lives were lost. In Bulletin No. 117 of the United States Department of Agriculture, Forest Service, the statement is made that in 1910 there were 936 fires in northern Minnesota and Wisconsin, burning over 1,051,333 acres and causing a loss of $1,721,752. Approximately one-third of these fires occurred on the watershed of the Lake of the Woods. Relative to the cause of fires in this year the statement is made:

> Up to the latter part of August there was a deficiency of precipitation in every district of the United States, and it was exceptionally dry in the Northwest, where the percentage of the normal was only 26.

The Chisholm fire of 1908 touched only a portion of the watershed. At this time 405,748 acres were burned over with a loss of $2,000,000. Similar conditions, and to a very large extent similar means of remedying them, are found on the Canadian side of the watershed.

In a written statement to the commission, dated October 7, 1913, the Director of Forestry of Canada says as to the effect of water levels on standing timber:

> The raising of the level of the waters above normal would injuriously affect the timber only so far as it would result in lands bearing timber being flooded or kept permanently water soaked. If the lands were flooded so that the water stood permanently above the level of the soil, all the trees in such an area would certainly die. If land previously well drained were kept soaked with water owing to the raising of the level, it would probably affect injuriously some species, although most species have a considerable power of adaptation where they have become well established. The final result, however, would be to change the character of the vegetation so that trees that grow best in moist situations, such as cedar, tamarack, black spruce, would succeed.
>
> The lowering of the level of the water would not likely cause any injurious effects. The better drainage might in some cases result in improved growth, and I doubt if the drying out would anywhere be sufficient to cause any serious injury.
>
> As a consequence, therefore, it is not at all likely that the raising or lowering of the level of bodies of water in the Lake of the Woods district would have any serious effect on the timber or forest growth. Such effect would be mainly confined to whatever area might be flooded as a result of the raising of the level of the water.

No record of the development of lumbering in the Lake of the Woods district would be complete without some account of the wood pulp and paper industry.

The machinery for adapting wood fiber to the manufacture of paper has been so improved during recent years that the annual consumption of wood pulp in the United States alone exceeds 3,000,000 tons, of which one-fifth is imported.[1] In 1911, 1,300,000 cords of wood, 85 per cent of which was spruce, were consumed in the United States in the manufacture of mechanical pulp. Of a total of 4,300,000 cords used during 1911 for pulp of all kinds, spruce fur-

[1] Bureau of Foreign and Domestic Commerce, Bulletin No. 110, 1916.

a, PAPER MILL AT FORT FRANCES.

b, PULP WOOD AT INTERNATIONAL FALLS.

nished 2,500,000 cords, or 58 per cent. With such an annual reduction of the available spruce supply we find mills in various localities using hemlock, poplar, balsam fir, tamarack, jack pine, or birch. The industry is essentially of a frontier nature. It requires a plentiful supply of wood and an abundance of cheap power, two things not readily obtainable in settled communities.

Making use of these two resources at the head of Rainy River, the Minnesota and Ontario Power Company is now operating one of the largest wood pulp and paper mills in America. This mill, part of which is located in International Falls, Minnesota, and part in Fort Frances, Ontario, has a daily capacity of 350 tons of paper. The paper for 65 of the important newspapers of the Northwest is supplied by it. From 1,200 to 1,500 men are daily employed at the mill itself. It is tributary to one of the largest spruce areas of the continent. The supply for this mill will eventually be drawn from a total area in both countries of approximately 25,000 square miles. Spruce covers approximately one-third of this tributary area. Of the other varieties suitable for paper making, jack pine, tamarack, balsam fir, poplar, and birch are the most important.

At the present time, a newspaper stock is manufactured at this mill. Approximately 175,000 cords of wood are used annually, each cord producing about four-fifths of a ton of paper. The newspaper, as manufactured here, is made up of a mixture of from 75 to 80 per cent of mechanically ground pulp and from 20 to 25 per cent of sulphite or chemical pulp. A sufficient quantity of both varieties is manufactured to supply the paper mill, except during a shortage of water power in dry years and during a decrease in head from backwater. During these periods, the ready-made pulp is imported from elsewhere, usually eastern Canada.

In the spruce-bearing lands the yield is stated to vary from 1 to 20 cords per acre, the higher yield being obtained from a comparatively small acreage. From 35 to 50 per cent of the pulpwood is cut directly by the company's forces. In the camps and on the drives to the mill approximately 2,500 men are employed. The remainder of the wood supply is purchased on the market or contracted for locally.

At the present time less than one-half of the raw material is transported by water to the mill, and the remainder by rail. The percentage of water transport will increase as the more distant districts are cut over. The duration of the present pulpwood supply tributary to Rainy Lake has been variously estimated, barring devastating forest fires, at from 25 to 50 years.[1]

[1] See United States Department of Commerce and Labor; Bureau of Foreign and Domestic Commerce, Bulletin 110, 1916; United States Department of Agriculture, Bulletin 343; United States Department of Agriculture, Forest Service, Bulletin 123, Bibliography of Pulp and Paper Industries; United States Department of Agriculture, Forest Service, Bulletin 127, Grinding of Spruce for Mechanical Pulp.

VIII.—MINING.

It was known in a general way almost from the time when the Lake of the Woods region was first discovered that it contained mineral deposits, but not until 1850 was ore definitely reported. In that year it was found near Gunflint Lake. A little later it was reported in the region now known as the Vermilion Range. Since that time, at various points throughout the Lake of the Woods watershed, there have been numerous discoveries of gold, silver, copper, iron, and other minerals.

Mining operations for gold are said to have been started as early as 1852. In 1872 gold was discovered at Partridge Lake, and it is said that small quartz nuggets were exhibited at the Philadelphia Exhibition of 1876. In his report on the "Geology of the Lake of the Woods,"[1] Dr. Robert Bell says:

> At the time of our visit (1881) no mining operations were going on at the Lake of the Woods, although some openings in search of gold had lately been made. Owing to the want of guides and the lateness of the season, it was found impossible to examine the various localities at which more or less work had been done. In 1879 I was presented by Mr. J. Sewe with a specimen from Hay Island of white quartz, containing needlelike crystals of hornblende with a little calcspar, which showed distinct specks of gold. It was assayed by Mr. Hoffman, chemist, of the survey, and found to contain 37.318 ounces to the ton (Report of Progress for 1878–79, p. 23H). We were shown specimens of copper pyrites in quartz and clay-slate, of galena in quartz, and of magnetic iron associated with jasper, all said to have been found in the eastern part of the northern division of the Lake of the Woods.

In 1884 Eugene Coste reported on the "Gold mines of the Lake of the Woods." These were for the most part on Big Stone Bay, some 10 miles southeast of Rat Portage (Kenora) and on Clear Water Bay, about 20 miles to the southwest. It appears from this report that in 1884 a number of gold-mining companies had been organized and a good deal of money invested in machinery, but the mining operations were apparently in the hands of very inexperienced men. At some mines stamp mills had been erected, with expensive machinery, before a shaft had been sunk or any knowledge obtained as to the extent or richness of the ore. At another place a 50-foot shaft had been sunk, with no vein to be worked.

For some years very little progress was made in gold-mining development in the Lake of the Woods region, beyond testing opera-

[1] Geological Survey of Canada Report, 1880–1882.

REGINA MINE.

tions and prospecting. Gradually, however, interest in the mining possibilities of the district increased; mining operations were furthered, and a gold and silver reduction plant was constructed at Rat Portage. By 1893 there were some 20 locations in the vicinity of Rat Portage, including the Sultana, a mine which later became one of the chief producers. In the following year gold discoveries were made in the Rainy Lake and Seine River districts, numerous veins being reported both on the Canadian and United States sides of the boundary.

By 1895 the occurrence of gold at numerous places, dotted over a large part of the country lying between the Lake of the Woods and Lake Superior had been demonstrated; and in 1896 much activity was displayed in developing and exploiting the various properties. In that year further discoveries were made, notably in the Shoal Lake neighborhood, where the Mikado and other mines were attracting attention.

Although at this period several of the mines were regarded as having reached a more or less permanent working status, yet the industry as a whole was recognized as being in the initial stages. The outlook, nevertheless, was very hopeful, and that the general expectation of the future prosperity of the gold mining industry on the Canadian portion of the watershed really rested on a substantial basis, is apparent in the gradual increase of gold yield for Ontario, from $2,000, in 1891, to $115,000 in 1896. By far the greater proportion of this increase was due to the yield from mines on the Lake of the Woods watershed.

The Sultana had come to be recognized as the chief mine of the Western gold fields. After years of hard work had overcome preliminary difficulties, a good financial return was at last being derived from a large body of rich quartz—in places 40 feet wide—and it was estimated that enough ore was in sight to last several years.

The increased activity and progress in 1897 were reflected in the provincial yield of gold, for that year, of $189,294. Ten mines contributed to this production—all of which mines, with the exception of one in eastern Ontario, were in the districts tributary to the Lake of the Woods. The principal mines being operated in 1897 were: In the Lake of the Woods district, Hay Island, Stella, Regina, Sultana, Burley, and Triumph mines; in the Shoal Lake district, Mikado and Yum-Yum mines; in the lower Seine district, Foley, Olive, and Golden Star mines; in the upper Seine district, Sawbill, Hammond, and Golden Reef mines.

In 1898, the provincial gold yield rose to $265,000, and the major portion of it came from the Sultana, Regina, and Mikado mines. The highest production of gold, up to the present time at least, within

the area under discussion, was reached in 1899 when, for the Province, it amounted to $421,951. This was derived chiefly from four mines, the Sultana, Regina, Mikado, and Golden Star.

There was a considerable falling off in the gold output for 1900; the amount for the Province was $297,495, but the chief source of supply was still the Lake of the Woods country. The immediate cause of this diminution was the stoppage of several producing mines, especially the Golden Star and Olive.

It is recorded that during the exceptionally dry season of 1900, the impeding of navigation, due to the low water on Rainy Lake, was a great hindrance to mining activity in the lower Seine district, as well as to the mining industry in other localities. The reduction works at Rat Portage stood idle for most of the year, although at Keewatin where a reduction plant had been erected, a considerable quantity of ore was treated.

During 1900, a large number of mines were closed down, thus manifesting the fact that a strong reaction had set in, quite in contrast to the activity which characterized the busy years culminating in 1899. As a consequence of this set-back, the Provincial gold yield fell from $244,443 in 1901 to $229,828, in 1902, then to $188,036 in 1903, and to as low as $40,000 in 1904.

In 1902, the Sultana mine was closed—its large ore body had faulted. In 1903, the Mikado was closed down. For a number of years these two mines had been substantial producers, and had shared the leadership in the Western mining field. Reference to the Sultana having already been made, it may be mentioned in passing, that the Mikado was in operation from 1896 to 1903, and during this period is credited with having produced over $500,000 in gold.

During the next seven years, ending with 1911, the gold production in Ontario fluctuated between $99,885 in 1905, and $32,445 in 1909, the average annual yield for the seven years being $62,062. During this period the Sultana and Mikado had both resumed operations, but were again closed, and for a part of this time the principal producer was the Laurentian mine situated in the Upper Manitou Lake district. The first results from the Laurentian were spectacularly rich, but later it was found that the ore had depreciated.

Up to the end of 1909 the aggregate value of the gold production in Ontario was $2,509,492, of which much the greater part was derived from the Canadian areas of the Lake of the Woods watershed.[1]

[1] The provincial gold yields were not tabulated in the earlier mining reports, and hence there was not sufficient detail from which to make a precise determination per se of the gold yield of the Lake of the Woods watershed. The mining branch of the Province of Ontario, however, has officially stated that prior to the discovery of the Porcupine gold fields by far the larger part of all the gold produced in the Province came from the watershed of the Lake of the Woods.

SULTANA MINE.

The year 1909 witnessed the discovery and initial development of the rich gold mines of the Porcupine region in northern Ontario. Following on this discovery the year 1912 saw the closing of practically all of the mines in the Lake of the Woods districts, and, in consequence, it may be stated that in 1913, 1914, and 1915 there was no gold production officially recorded for western Ontario. The discovery of these northern gold deposits and the extensive closing of the western mines may be said to stand related on the basis of cause and effect. Although the western gold field, for a time at least, might have passed into a stage of depression, it is reasonable to suppose that gold mining would have soon been resumed but for the greater inducements afforded as a result of the Porcupine discoveries, and a portion at least of the amount of energy and capital absorbed in the north would otherwise have been available for the continued exploitation of the gold deposits of western Ontario.

In order more fully to realize the overshadowing attraction exercised by the Porcupine gold fields, it is sufficient to observe the tremendous increase in the provincial gold production directly consequent upon the Porcupine discoveries. In 1911 the yield of gold in Ontario was $42,637. In 1912 it had risen to $2,114,086; in 1913 to $4,558,518, and in 1914 to $5,529,767, when for the first time Ontario assumed the lead in gold as produced by the various Provinces of Canada. In 1915 the provincial production reached $8,501,391, while in 1916 the returns indicate a yield of about $10,000,000.

Now, with these figures in view, it is not surprising that the gold fields of the Lake of the Woods watershed are at present more or less in a state of practical neglect. It is certain, however—and this is the view expressed by the provincial mining authorities—that in the future there will be renewed development of gold mining upon this watershed. The ore there while not generally high in grade is, for the most part, free milling. In the past the heavy cost of equipment and transportation, accompanied too frequently by imprudent and, comparatively speaking, unduly expensive methods of mining, have borne heavily upon the returns from the various mines. The gold deposits of these western mining fields are by no means worked out, and many properties only require the application of more economical equipment and more scientific and up-to-date means of reclamation in order to insure profitable returns. Wood, water, and labor are at hand, and in fact all essentials are available to enable skillful and prudent mining to obtain adequate remuneration.

Another deterring influence now present is the condition of affairs growing out of the European war. When normal conditions are restored, a further period of activity seems assured, and, indeed, present indications point to an early mining revival in the Lake of the Woods district.

As already mentioned, the Lake of the Woods region contains mineral deposits other than gold. Mr. Andrew C. Lawson, in his "Report on the Geology of the Lake of the Woods Region,"[1] says:

> Silver occurs in the auriferous quartz veins of the Lake of the Woods, generally as an accessory mineral, in small quantites, but sometimes, as the assays of the ore of the Pine Portage mine show, in greater proportions by weight than the gold. No leads sufficiently rich in silver ore to be mined for that metal have as yet been discovered.
>
> Copper pyrite is of very common occurrence in leads of quartz, both of those that have been mined for gold and those that have not warranted such operations. It is not found, however, in sufficient quantities to be worked as an ore for copper, and the likelihood of copper mining becoming an industry here is a matter to be determined very largely as yet by the discoveries of the prospector.

Recently, deposits of copper have been discovered in the Rainy River district near Mine Center, which are described as very rich. These deposits are already being mined. The country immediately adjoining the Lake of the Woods watershed to the north and east has also been found to be highly metalliferous. It is claimed that remarkable copper deposits have been discovered within the last year near Kashabowi, just outside the watershed boundary.

The development of the iron-ore district, on the Minnesota side of the watershed, dates from 1880. The first shipment of ore was made in 1884. During the year 1915, 1,656,465 tons of ore were shipped from the Vermilion Range. The ore reserves in the ground in 1915 on the Vermilion Range were 10,209,902 tons.

The Mesabi Range lies mainly contiguous to the watershed, only a small portion of the easterly end, containing low-grade ore, lying within its limits. The first real prospecting on the Mesabi Range was done in 1890, in the vicinity of Mount Iron. The largest mine on the Mesabi Range shipped 2,311,923 tons in 1915. The entire shipment from the Mesabi Range in 1915 was 29,633,046 tons, and the ore reserves for 1915 totaled 1,382,644,910 tons. In 1910 there were 108 mines in St. Louis County, employing 17,643 men at an average wage of $2.65 per day. It was estimated that 85,000 people in St. Louis County were directly dependent upon the iron-mining industry for a living.

On the Canadian side, discoveries of iron have from time to time been reported, but up to the present time no serious attempts have been made to develop mines. So far as the Lake of the Woods proper is concerned, Mr. Lawson wrote in 1885:

> Deposits of iron ore have not been found as yet on the lake, although a large proportion of the rocks is very rich in disseminated magnetite. Magnetic sand, derived from the decomposition of the Laurentian gneiss, occurs on the west side of Falcon Island, in stratified layers, which have evidently been so arranged

[1] Geological Survey of Canada Report, 1885.

IRON ORE, HUNTERS ISLAND.

by the sifting action of the waves on the beach, separating out the heavy magnetite from the light, siliceous, and feldspathic grains. The line of separation between the black magnetic sand and the light yellow sand is a very distinct one, and the percentage of magnetite in the former is large, but the deposit is an extremely recent one and the abundance of the magnetic sand is not so much as to be of economic importance.

At Atikokan, in the upper part of the watershed, hematite ore was for a time mined. In the Hunter Island district diamond drilling has revealed the presence of extensive and valuable deposits of iron ore, which sooner or later will undoubtedly be worked. There is reason to believe that systematic exploration will reveal the presence of other iron-ore bodies on the northern extensions in Canada of Minnesota iron ranges, which lie but a short distance south of the international boundary line.

In regard to other minerals in the Lake of the Woods watershed, the following may be quoted from Mr. Lawson's report:

Zinc-blende and galena are not uncommon in such quartz veins as have been opened, and I have found both in small quantities in different parts of the district.

Molybdenite occurs in small veinules traversing the granatoid gneiss of Quarry Island, and I have been given large specimens of the same material said to have been found in the bush between Rossland[1] and the Lake of the Woods.

Antimony ore is said to have been found in Ptarmigan Bay, but not so far as I could ascertain in any considerable quantity.

Cobalt is found to occur in traces. Mispickel and iron pyrite are comparatively abundant in veins of various dimensions, the larger of which may prove of value should the manufacture of arsenic and sulphuric acid ever become profitable in this part of the country.

In conclusion, it may be emphasized that in the development of the mining industry throughout this wide region, both in the United States and in Canada, navigation facilities are of the greatest importance, especially as this mode of transport is practically the only means available by which certain extensive areas may be reached. Free access by water is essential not only to numerous islands in the Lake of the Woods, Rainy Lake, and other lakes within the watershed containing mineral deposits, but also to great stretches of the mainland which at present and probably for some years to come will be remote from railways or even roads.

[1] A siding on the Canadian Pacific Railway, 9 miles east of Kenora, now known as Margach.

IX.—FISHERIES.

The first white fishermen on the Lake of the Woods of whom we have any record were the men of La Vérendrye's exploring expedition in 1733–34. As already indicated, De Noyon had reached the Lake of the Woods some 45 years earlier, and it is probable enough that he and his men may have drawn some of their food supplies from the teeming waters of the lake, but that is only conjecture, as the meager record of his journey is silent on the subject. The same thing may be said of La Noüe's expedition to Rainy Lake in 1717 or 1718.

In La Vérendrye's journal[1] of 1733 he says:

> The heavy rains of the spring had been incessant and had done great damage to the wild oats (wild rice) on which we were counting, which puts us in a difficult position as we had not enough of provisions to last the winter. I bethought me to send 10 men to the other side of the lake (Lake of the Woods), which is 25 leagues wide, with tools for building themseves a shelter at the mouth of a river running in from the north-northeast, and with nets for fishing. They caught that autumn (1733) 4,000 big whitefish, not to speak of trout, sturgeon, and other fish in the course of the winter, and returned to Fort St. Charles on the 2d of May, 1734, after the ice had melted. Thus they lived by hunting and fishing at no expense. The rain that had done us harm in the spring troubled us again in the month of September. It rained so heavily from the 6th to the 14th of September that for a long time the water of the lake was so discolored that the savages, of whom there were a great many at our fort, could not see to spear the sturgeon, and had nothing to eat. In this extreme need of theirs I made over to them the field of Indian corn which I had sowed in the spring.

There can be no doubt that the Indians of the Lake of the Woods had carried on primitive fisheries in the lake long before white men penetrated so far to the west. The narratives of all the early travelers, explorers, and fur traders make it clear that the Chippewa, who inhabited the region, as well as the Monsoni and Cree who frequented its waters, in their early history, depended largely on fish for food.[2] Joseph La France, who traveled westward through Rainy Lake, Rainy River, and the Lake of the Woods, in 1740, says:

> He passed the Lake la Pluie (Rainy Lake) in the latter end of April and beginning of May, and stayed 10 days at the fall with the Monsoni, where they fish with nets at the bottom of the fall. They have two great villages, one on the north side, and the other on the south side of the fall. The River la Pluie, which falls from the lake, is a fine large river which runs westward, and is about 3 furlongs in breadth; its course is about 60 leagues before it falls

[1] Journals of La Vérendrye. Champlain Society, Toronto.
[2] Hodge, Handbook of American Indians.

into the Lake Du Bois, or Des Isles (Lake of the Woods), and is free from cataracts, having only two sharp streams. He was 10 days going down it in his canoe; the whole country along its banks is full of fine woods, in which are great variety of wild fowl and beasts, as wild beavers, stags, elk, deer, etc., and the river and adjoining lakes full of excellent fish. This river falls into the Lake Du Bois, where he arrived about the end of May. This lake is very large and filled with fine islands; he was 30 days in passing it, fishing and hunting as he went with the natives, and stayed a month in one of the islands with the Monsoni and Sturgeon Indians, who live on the north side of this lake, and meet in that island to be merry and confirm their friendship and alliance; these last are called so from the great number of sturgeon taken in this lake, which is the greatest part of their provisions.[1]

Jonathan Carver[2] was at Grand Portage, at the western end of Lake Superior, in July, 1767, and in his Travels describes the lakes to the westward, probably from accounts he received from the fur traders at Grand Portage. He says that all these lakes were stored with fish, such as trout and sturgeon.

Alexander Henry[3] descended Rainy River in 1775 and says that at the mouth of the river there was "an Indian village of a hundred souls, where we obtained a further supply of fish. Fish appears to be a summer food."

Peter Grant,[4] who was in charge of Rainy Lake House in 1799, says that Rainy River, or "River of Lac La Pluie," as he calls it, "abounded with sturgeon and various kinds of fish, to which the natives have recourse in times of scarcity." He gives the following interesting description of the methods of fishing employed by the Chippewa Indians, which were probably very little changed from those they used before white explorers and traders first came among them:

They fish with nets, hooks, lines, and spears, but they have a method of taking sturgeon with a kind of dragnet or seine which, I believe, is peculiar to themselves. The net used for this purpose is about 20 feet long by 6 feet deep when shut double. It is dragged between two small canoes having two men in each; while the bowmen paddle gently down the stream, the men in the sterns hold the seines by means of long cords fixed to each end and which can be shortened or lengthened according to the depth of water and the wish of the seineurs. Two stones are suspended from the lower ends of the seines, by which the nature of the bottom and the soundings are ascertained, a very necessary precaution to keep the whole clear of foul bottom. The course of the canoes must form an obtuse angle with the middle of the seine. Those nets are mounted like the English dragnets, with small knobs of cedar fixed to the upper border instead of cork. When by the vibration of the cords they perceive that fish is taken they instantly haul up and paddle with all their might to bring the

[1] Joseph La France's narrative, in "Report from the committee appointed to inquire into the state and condition of the countries adjoining to Hudsons Bay and the trade carried on there." London, 1745.

[2] Travels Through the Interior Parts of North America, p. 88.

[3] Travels and Adventures in Canada and the Indian Territories, p. 241.

[4] "The Sauteux Indians." In Masson, Bourgois de la Compagnie du Nord-ouest, II, p. 311.

canoes together and thereby shut up the fish in the seine. This method of fishing is, of course, practicable only in rivers, narrow channels, and small bays where the bottom is clear.

Elsewhere Grant says that the Chippewa in the spring, when the hunting season is over, "generally assemble in small villages, either at the trader's establishment or in places where fish or wild fowl abound; sturgeon and whitefish are most common, though they have abundance of pike, trout, suckers, and pickerel." "They sometimes," he adds, "have the precaution to preserve some for the summer consumption. This is done by opening and cleaning the fish and then carefully drying it in the smoke or sun, after which it is tied up very tight in large parcels, wrapped up in bark, and kept for use."

Daniel Williams Harmon,[1] of the North West Company, who visited Rainy Lake Fort in the year 1800, says that Rainy Lake and Rainy River "are said to contain excellent fish, such as sturgeon, whitefish, etc."

In the summer of 1800 Alexander Henry,[2] nephew of the elder fur trader of the same name, also traveled to the western plains by the same route. He spent the night at the trading post of the North West Company, a little below the present town of Fort Frances. In continuing down the river, he says:

> We have great plenty of sturgeon at present. * * * We camped below Manitou Rapids, where we found several Indians fishing. They had a great many sturgeon and various kinds of small fish, a few of which were exchanged for liquor.

Crossing the Lake of the Woods, he says:

> We found a number of Indians. * * * We purchased a few fish and dried hurtleberries. * * * We had left them but a short time when a sturgeon almost jumped into my canoe; his head struck the gunnel near one of the men who, instead of taking hold of him, gave a scream, and the fish fell into the water again.

Alexander Mackenzie,[3] writing about the end of the eighteenth century, says that Lake Namakan, east of Rainy Lake, "takes its name from a particular place at the foot of a fall (Kettle Falls), where the natives spear sturgeon." Of Rainy River he says that "its waters abound in fish, particularly the sturgeon, which the natives both spear and take with drag-nets."

John McLoughlin, in the manuscript narrative elsewhere alluded to, says: "The fish got in these lakes and rivers are sturgeons, pike, pickerel, whitefish, trout, and suckers."

So much for the early explorers and fur traders. From later travelers some additional information may be gleaned bearing upon the subject of the fisheries of the Lake of the Woods and its tributary

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[1] Journal of Voyages and Travels, p. 19.
[2] New Light on the Early History of the Greater Northwest, I, pp. 20, 23.
[3] Voyages from Montreal Through the Continent of North America, p. xci.

WARROAD FISHERMEN.

waters. Keating,[1] in his narrative, says, that the principal fish in Rainy River is the sturgeon. He visited Rainy Lake Fort in August, 1823, and says that the soldiers of his party "were kept busy while encamped at the fort in fishing for the pike and fresh-water salmon which are found in great abundance at the falls."

Paul Kane, in his entertaining account of his journey across the continent in 1845, says:

> Vast quantities of whitefish and sturgeon are taken at the foot of the rapids (Fort Frances) with which our mess table at the fort was abundantly supplied; indeed, the chief food here consists of fish and wild rice.

In crossing the Lake of the Woods, he adds:

> We met some Indians from whom we purchased seven fine sturgeons, each weighing perhaps 40 or 50 pounds. We paid for the whole one cotton shirt.[2]

Returning by the same route in 1846, Kane spent a day or two at Rat Portage (Kenora). "The Indians there," he says, "subsist on sturgeon and whitefish in the summer and rice and rabbits in the winter. We rested ourselves here for two days and employed ourselves principally in feasting on whitefish." At Fort Frances, he notes in his journal:

> The Indians catch great quantities of sturgeon at the foot of these falls in the month of June. The sturgeon here are very small—seldom weighing more than 40 or 50 pounds—at least in comparison with those taken at the mouth of Frazer's River on the west side of the mountains, which often weigh from 5 to 7 hundredweight. * * * The Indians live here, as at Rat Portage, on rice, fish, and rabbits.

W. F. Butler,[3] in one of his entertaining narratives of travel in the Northwest, describes the Lake of the Woods and Rainy River as they were in 1870, and, referring to the tributaries of the latter, says:

> It is down these rivers that the American Indians come to fish for sturgeon in Rainy River.

In 1910 the United States National Museum published a memoir on "The Fishes of the Lake of the Woods and Connecting Waters" by Barton Warren Evermann and Homer Barker Latimer, of the United States Bureau of Fisheries. This is the first report that has been published on the subject. In 1894 Prof. Albert J. Woolman and Prof. Ulysses O. Cox made a collection of fishes obtained in the Lake of the Woods region, but no formal report was published. This collection was made under the direction of the Rathbun-Wakeham Joint Commission relative to the preservation of the fisheries in waters contiguous to Canada and the United States. In August, 1908, and again in 1909, the International Fisheries Commission visited Rainy Lake and the Lake of the Woods and obtained specimens of some of the food fishes as well as much valuable data concerning the fish-

[1] Narrative of an Expedition to the Source of St. Peters River.
[2] Wanderings of an Artist Among the Indians of North America, pp. 61, 451.
[3] The Great Lone Land, p. 165.

eries of those waters. Dr. S. E. Meek, of the Field Museum of Natural History, Chicago, who visited the Lake of the Woods and Rainy Lake in October, 1908, in connection with the work of the International Fisheries Commission, collected a considerable number of specimens of food fishes and some information concerning the fisheries of those waters. This is practically all that had been accomplished previous to the brief report of Messrs. Evermann and Latimer.

From such published records as were available, and from data furnished by Mr. Paul Marschalk, of Warroad, Minnesota, and Captain Arthur Johnson, of Kenora, Ontario, the authors of the report compiled a series of tables, which, though far from complete, are of interest and value. From these tables it appears that the pound-net catch of whitefish, yellow pike, jackfish, and sturgeon in the Lake of the Woods from 1888 to 1909, both inclusive, amounted to 22,891,671 pounds, valued at $781,795, of which 17,878,306 pounds, valued at $582,788, are credited to the United States, and 5,103,365 pounds, valued at $195,201, are credited to Canada. These and other figures in the memoir relating to the Canadian catch are considerably below those obtained from sources in Canada. It is probable that they represent the Canadian catch shipped through Warroad and do not include quantities shipped through Kenora. (See Appendix.) The gill-net catch of whitefish, yellow pike, and jackfish in the Canadian waters of the Lake of the Woods, in 1892 to 1909, is given as 3,663,394 pounds valued at $120,760. The total pound-net and gill-net catch for the period 1888 to 1909, so far as stated in this memoir, is therefore 26,555,065 pounds, of a value of $900,109. This includes figures for the catch at Oak Island, in 1900, 1902, 1907, and 1908. The tables in the Appendix bring the figures down to and including 1914. High-water mark seems to have been reached in 1894, when the total catch reached 3,125,835 pounds, valued at $88,225. Particulars of the Rainy Lake catch are only available for 1908, when the total was 160,000 pounds, valued at $4,050. The commission has, however, since obtained the following particulars as to the Rainy Lake fisheries in 1916: Canadian fishermen operating under licenses granted by the Province of Ontario numbered 62 and operated 36 boats, including 18 gasoline boats, valued at $8,290. The value of pound nets was $5,500 and of gill nets $4,610. Ice houses and freezers amounted to $2,325 and wharves and piers $555. The total value of fish caught by Canadian fishermen in 1916 was $25,133.19, making the total value of the Canadian fisheries in Rainy Lake in 1916, $46,413.19. These figures do not include value of fish caught by Indians and sportsmen. For the same year there were 43 United States fishermen engaged in the fisheries on Rainy, Kabetogama, Namakan, Sand Point, and La Croix Lakes under licenses granted by the Minnesota Game and

Fish Commission. Seventy-three boats, including 30 gasoline boats, of a value of $20,000, were employed. The value of pound nets was $8,250 and of gill nets $1,960. Ice houses, freezers, and other buildings, with wharves and piers, were valued altogether at $16,600. The total catch of fish was 200,492 pounds, valued at $11,294.62. The total value of the United States fisheries in these waters was therefore $58,104.62. The Indian catch in both Canadian and United States waters for the year is estimated at over $5,000.

The Evermann and Latimer report contains some interesting particulars as to the sturgeon fishery of the Lake of the Woods.

"Lake of the Woods," they say, "is the greatest sturgeon pond in the world. Up to about 1892 sturgeon swarmed in this lake in almost incredible numbers. In that year the sturgeon fishery began to assume considerable proportions. By 1893 to 1896 it had become of great importance. In 1893 the catch in American waters amounted to 1,300,000 pounds, valued at $26,000. The yield of caviar in the same year amounted to 97,500 pounds, valued at $19,500; and the amount of sturgeon sounds was 5,830 pounds, valued at $5,830. Thus the total for 1893 was 1,403,330 pounds, valued at $51,330. By 1903 the sturgeon catch had dwindled to 45,239 pounds, worth $2,714, and the caviar taken in that year amounted to only 1,550 pounds and valued at $1,240. Since 1903 the catch of sturgeon has fluctuated somewhat, but has always been low. In 1908, in American waters, it amounted to 87,182 pounds, worth $8,718. According to local fishermen there has been a slight increase in the number of sturgeon in the last few years. They constitute a large part of the pound-net catch. A 4-foot sturgeon will dress about 15 pounds, which is too small for a minimum size; it would be better to make 20 pounds dressed the minimum. The spawning season is in the spring and is probably over by the end of May. The principal, if not the only, spawning ground is Rainy River."

From the table of statistics of the sturgeon fishery from 1888 to 1909, both inclusive, it appears that the total yield was 11,593,860 pounds of a value of $553,603. These were the prices paid to the fishermen at their fisheries. No figures are given for the Canadian catch from 1888 to 1891, and presumably the Canadian fishery started in 1892, as the catch was a comparatively small one in that year. The catch rose rapidly from 40,000 pounds in 1888 to 1,650,000 pounds in 1893. In that year 123,750 pounds of caviar were shipped, of a value of $24,750. The sturgeon fisheries remained around 1,500,000 pounds per annum from 1893 to 1896, when they began to diminish and dropped rapidly to a total of 53,316 pounds in 1909.

"The great decrease in the sturgeon catch of the Lake of the Woods," say the authors of this paper, "is without doubt chiefly due to overfishing, although it is claimed by local interests that recent

years show a slight increase in the catch and the statistics sustain this contention. There is no evidence that the sturgeon have actually increased in abundance. This increased catch is more likely due to closer fishing than to an actual increase in the abundance of the species. The International Fisheries Commission is of the opinion that all sturgeon fishing in these waters should cease for a period of four years."

It is interesting to note that while in 1888 3,000 pounds of caviar sold for only $300, in 1909 729 pounds were sold for $1,093.

Archibald Blue, in his "Tour of Inspection in Northwestern Ontario," says:

> Fishing is now a very important industry in Lake of the Woods. There are stations on all the principal bays, and a number of tugs are employed to make regular rounds and convey the catch to Rat Portage, where shipments are made to Winnipeg, St. Paul, Minneapolis, and other markets throughout the Northwest. The sturgeon and whitefish of Lake of the Woods are of excellent quality; but at the rate at which operations have been carried on during the last two years it is feared that the waters will soon be fished out. The roe of sturgeon is shipped in large quantities to Europe, where it is manufactured into caviar.[1]

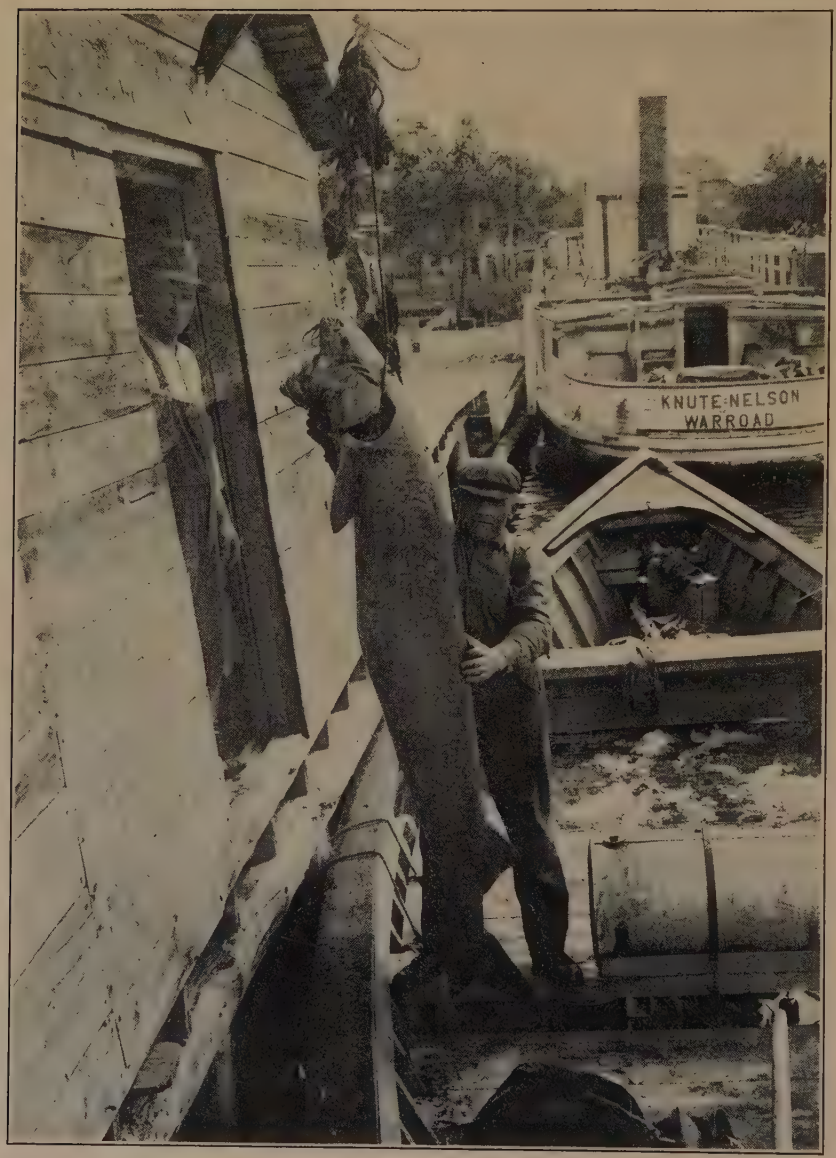
At the 1912 hearings held by the commission at Warroad, some testimony was offered by Mr. Paul Marschalk as to the fisheries of the Lake of the Woods. In reply to the question (p. 97) "In what respect does the level of the lake affect the fishing interests?" Mr. Marschalk replied, "Too high a level is apt to overflow the low shores and carry the muskeg into the lake, and dirty the water, and the fish will die and become unfit for food."

On the same point Mr. Edwin Tinsley, superintendent of game and fisheries of Ontario, said (p. 171):

> There is one matter that is of vital importance to the fisheries and should not be overlooked, and that is the effect of the lowering of water upon fish spawn. During the spawning season of certain species of fish if the water were lowered it would leave the spawn high and dry on the land, there to rot, and as the Lake of the Woods is one of the most important lakes in the Province and will in time become even more of an attraction to the tourist than it is to-day, the protection of the fisheries is of the utmost importance. Indeed, this department would not be inclined to consider favorably any request for the restocking of these waters if they had not the assurance that the spawn of the fish they deposited therein would be properly protected. I am now dealing principally with the game fish, but as commercial fishing is carried on to quite an extent in the Lake of the Woods, the effect of the lowering of water on that class of fish should be considered most carefully. It is of the greatest importance to the Province that the water in this lake should not be lowered from the prevailing high-water line.

At the 1915 hearings in Warroad Mr. Marschalk again gave evidence as to the fisheries of the Lake of the Woods, and repeated

[1] Fifth Report of the Ontario Bureau of Mines, 1895, p. 167.



LAKE OF THE WOODS STURGEON.

his statement that the food fishes of the lake were injuriously affected by high water in the southern portions of the lake (p. 192).

At the same hearing evidence was obtained from Prof. Edward E. Prince, commissioner of fisheries of Canada, and Canadian member of the International Fisheries Commission. Prof. Prince said (p. 267):

> The fisheries certainly have declined during the period I have known this lake, very, very seriously. Some of the fisheries which were extremely important when I first visited the Lake of the Woods (in 1893 or 1894) are now practically extinct. I refer especially to the sturgeon fishery which, at one time, was of prime importance, one of the most valuable fisheries on the international boundary waters in the Lake of the Woods; and the whitefish fisheries have also declined very seriously.

Prof. Prince, being asked the cause of this decline, said:

> The main cause which, as an expert, I should attribute this decline to is over-fishing; and that is the testimony, also, of the most important experts who have visited the Lake of the Woods,

Asked as to the effect of high water on food fishes in the Lake of the Woods, Prof. Prince gave it as his opinion that it would not have any appreciable effect. As between considerable fluctuations in the level and a fairly uniform level he stated that the latter condition would be preferable for the fisheries (pp. 268–70).

In a communication to the commission, dated January 2, 1914, Prof. Prince submitted the following remarks on the question of the fisheries and the effect thereon of various levels in the Lake of the Woods:

> I have had many opportunities of observing the effect upon fish and fisheries of the lowering and also of raising of lakes and their tributary streams, and am therefore able to speak from a basis of experience upon the effect on fish and fisheries of the lowering of such waters as those of Lake of the Woods.
>
> The effects of lowering such waters are in the main threefold:
>
> First. The spawning grounds of species which spawn in comparatively shallow areas, such as sturgeon, wall-eyed or yellow pickerel, maskinoge, jackfish or pike, perch, various species of bass, the sunfish, and especially catfish, small cyprinoids, suckers, and kinds of fish upon which more important fish feed, are injured by being dried up and exposed to fatal influences of heat and cold.
>
> Second. The resorts of young fish of more valuable species are also destroyed. These fish, after hatching out, resort to inshore shallows and the shores of islands where their special food abounds. They are also safe from the attacks of mature fish in such shallow areas. When these areas disappear through the lowering of the water they are often replaced by deep-water areas with abrupt margins, and the effect both upon the fish and upon their food supplies is disastrous. Thus crayfish, a kind of fresh-water lobster, abound in gravelly shallows and form the special food of bass, pickerel, and esteemed kinds of fish, and when the water is lowered these crayfish perish in vast numbers.
>
> Third. Any changes in the level of the water are ruinous to fish in the ways indicated, especially if these areas are old-established bays and shallow inshore flats. It is a strange fact that when lakes are lowered and new shallow areas are formed by the receding water the fauna of older areas is not created anew, nor are the conditions reproduced readily which are appropriate to make

them good spawning grounds. Newly formed shallows instead of becoming feeding grounds or spawning grounds become the resort of enemies of fish of various kinds, such as bullfrogs and various species of toads and frogs, which are a menace to young fish and which occur far less frequently in abundance on old-established gravelly areas which are the favorite resorts of young fish.

The considerations stated above are based on observations made by me not only in Canada but in Britain. Many years ago in Yorkshire (at Adeldam, near Harrowgate), where the lowering of an old lake abounding in fish resulted in their total annihilation, fish and fishing became things of the past, and the lowered lake became a resort of reptiles, snakes, lizards, frogs, etc., and the fish entirely disappeared. Again, four years ago I observed on the Upper Ottawa, above Pembroke, shallow areas along the Ottawa River dried up on account of the lack of rain, and favorite resorts of fish diminished as the water receded and finally dried up. I personally noticed that as the gravelly shallows became shallower bullfrogs increased in numbers, attracted by the multitudes of young fish upon which they feed. The young fish, including bass, maskinonge, jackfish or pike, mullets, fallfish, catfish, sturgeon, etc., crowded together, and died in large numbers, or were eaten up by frogs and destructive reptiles.

On large sheets of water, like Lake of the Woods and along the Great Lakes, such disastrous destruction of young fish would result on a vast scale, and the innumerable islands existing, with shallow bays and extensively gravelly flats, would add to the destruction.

I may add that whitefish and trout, though naturally deeper water fish, are very frequently found in inshore shallows, which they resort to for the purpose of feeding on minute crustaceans, etc.

Captain A. Johnson, of the Armstrong Fish Company, who gave evidence at Kenora, stated that about $150,000 was invested in the fishing industry on the Canadian side of the lake.[1] The total investment on the United States side, as furnished by Mr. Marschalk to the consulting engineers to the commission is $79,950.

At the hearing in Kenora in 1915, it was stated that the Dominion Government had built a fish hatchery at that place in 1914, at a cost of about $60,000.[2]

For a number of years the Minnesota State Fish and Game Commission has taken from the streams of the Lake of the Woods watershed, considerable quantities of pike spawn for distribution throughout of waters of the state. The largest spawn-distributing station on the watershed is at Tower, on Lake Vermilion. In recent years the pike spawn has been taken at Pipestone Falls, at the outlet of Basswood Lake; at the mouth of Ash River, on its entrance to Kabetogama Lake; on Lac la Croix, and at several other localities.

In a statement given to Mr. S. S. Scovil, engineer of the Lake of the Woods Technical Board, Ottawa, Captain Johnson has this to say as to the effect of lake levels on the fishing industry in Canadian waters:

1. That the lake should be kept at a stated level or regulated between two fixed levels, but that no greater range than 2 to 3 feet be allowed.

[1] Further public hearings, 1915, p. 412.
[2] Idem, p. 414.

2. The reason given for this is that any great fluctuation in lake level would seriously endanger the future supply of fish.

Most of the various kinds of fish caught in the lake spawn in shallow water, and if any extreme drop should occur in lake level after such spawn has been deposited, then the spawn would be lost on being exposed to the atmosphere. Also, if the lake were kept at an elevation, as stated above, then a greater area of shallow water would be thrown open for spawn beds.

Another effect of great fluctuation in lake level would be on pond net fishing. In this case the nets are designed for a certain depth of water, being attached to stakes set in a stated manner, and any great change in water surface in any one year would entail the setting of new stakes and nets, with a resulting increase in expense. A great lowering of the water has been known to kill thousands of fish, such as bullheads, which inhabit the shallow water of marshes, etc. This occurred during the year 1911.

X.—NAVIGATION.

Transportation in the Lake of the Woods region was, throughout its early history, synonymous with water transport. In fact, until quite recent years waterways were the only thoroughfares of the region. Railways were unknown, and the nearest approach to a highway was an occasional and very limited trail through the wilderness.

The earliest means of water transport worthy of the name was the birch-bark canoe of the Indian, and this was at once adopted by explorers and fur traders, the only important change being the building of larger canoes than were generally used by the natives. Peter Grant, of the North West Company, in his account of the Sauteaux Indians,[1] and the fur trade in the Lake of the Woods region, has the following description of the canoe of the traders, and how it navigated these intricate watercourses:

> The Northwest Company's canoes, manned with five men, carrying about 3,000 pounds; they seldom draw more than 18 inches of water and go, generally, at the rate of 6 miles an hour in calm weather. When arrived at a portage, the bowman instantly jumps in the water, to prevent the canoe from touching the bottom, while the others tie their slings to the packages in the canoe and swing them on their backs to carry over the portage. The bowman and steersman carry their canoe, a duty from which the middlemen are exempt. The whole is conducted with astonishing expedition, a necessary consequence of the enthusiasm which always attends their long and perilous voyages.
>
> It is pleasing to see them, when the weather is calm and serene, paddling in their canoes, singing in chorus their simple melodious strains and keeping exact time with their paddles, which effectually beguiles their labors. When they arrive at a rapid, the guide or foreman's business is to explore the waters previous to their running down with their canoes, and, according to the height of water, they either lighten the canoe by taking out part of the cargo and carry overland or run down the whole load.
>
> It would be astonishing to an European observer to witness the dexterity with which they manage their canoes in those dangerous rapids, carrying them down like lightning on the surface of the water. The bowman, supported by the steersman, dexterously avoids the stones and shoals which might touch the canoe and dash it to pieces, to the almost certain destruction of all on board. It often baffles their skill, when the water is very high, to avoid plunging in foaming swells on the very brink of the most tremendous precipices, yet those bold adventurers rather run this risk, for the sake of expedition, than lose a few hours by transporting the cargo overland.
>
> When they are obliged to stem the current in strong rapids, they haul up the canoe with a line, all hands pulling alongshore and sometimes wading through the water up to their middle, except one man, who remains in the stern of the canoe, in order to keep it in the proper channel; this part of their duty is always accompanied with much labor. When the wind favors, they always carry sail, and in a fresh gale will generally go 8 or 9 miles an hour.

[1] Masson, Bourgeois de la Compagnie du Nord-ouest, 11, 313–314.

a, AMONG THE ISLANDS.

b, KENORA.

A more detailed description of the birch-bark canoe is found in Keating's narrative:[1]

We were divided into three bark canoes, known by the name of "canos du nord." Although these are made nearly on the same model, yet there is great difference in their speed, burden, soundness, etc., according to the skill manifested in their construction.[2] A canoe of this kind is generally constructed of ribs of cedar bent so as to impart to it its proper form, the ends being secured to a band that forms the superior edge of the vessel, and acts as a gunwale; over these ribs the birch bark is laid in as large pieces as possible, generally so that there shall be but two longitudinal seams, and two or three transverse; between the bark and the ribs very thin splints of cedar are placed, so as to prevent the bark from splitting; all the joints are sewed with long threads obtained by splitting the roots of a tree called by the voyageurs *epinette*, and which is probably a spruce. To this thread the term *watap*, used by the Chippewas, is applied by the Canadians; the seams as well as the cracks are covered with pitch (called by the Chippewas *peke*) made of the gum of the epinette; this is applied hot and renders the canoe water-tight. In this manner a little vessel is obtained, very well calculated for traveling on these waters, as it will carry a burden of upward of 3,000 pounds. * * * Those which we used were 30 feet long by about 4 feet wide in the middle, and perhaps 30 inches deep. A number of transverse bars serve to keep the canoe in its proper shape. The seats of the paddlers are suspended to the gunwale. The bow and stern are sharp and turned upward.

Four main canoe routes were recognized between Lake Superior and Lake Winnipeg, three of which led through Rainy Lake, Rainy River, and the Lake of the Woods, and these three were in more general use during the period of exploration and the fur trade.

The route first discovered was that by way of the Kaministikwia River. As elsewhere mentioned, Jacques de Noyon, as early as 1688, made his way by the chain of rivers and lakes leading up from the Kaministikwia to the height of land and down the western slope to Rainy Lake. La Noüe followed the same route in 1717. Thereafter the Kaministikwia route seems to have been abandoned in favor of that by way of Grand Portage, until the former was rediscovered by Roderick McKenzie, of the North West Company, in 1798.

The first mention of the Grand Portage route is contained in a letter by an officer named Pachot, who, referring to a proposed trading establishment on Rainy Lake, says: "The best route to go to the proposed establishment would be by a small river named the Neutokaogane (or Nantokougane), which is about 7 leagues from Kaministigoya." The small river named was that now known as Pigeon River, and the route was the afterward famous Grand Portage Route.

The explorer La Vérendrye, or rather his nephew, La Jemeraye, was the first white man, of whom we have any knowledge, to paddle from Lake Superior to Rainy Lake by way of the Grand Portage

[1] Narrative of an Expedition to the Source of St. Peters River, II, pp. 76–77.

[2] See also Peace River: A Canoe Voyage from Hudson's Bay to Pacific. Edited by Malcolm McLeod. Ottawa, 1872, p. 41.

route. La Vérendrye does not say in his journals why he adopted this route, in preference to that by way of the Kaministikwia, of which he must have had knowledge, but probably he had learned from the Indians that it possessed advantages over the latter. In any event, he and his men used it altogether during the many years that he was engaged in exploring the great western country; the same route was followed by other French explorers and traders down to the close of the period of French rule in Canada; and it was adopted by the British fur traders as their principal thoroughfare until difficulties in connection with the international boundary drove the officers of the North West Company to search for other routes more to the north.

The history of the reopening of the original route discovered by De Noyon is somewhat curious. Toward the end of the eighteenth century, it having been found that Grand Portage, up to this time the principal establishment of the North West Company, was on American territory, a determined effort was made to discover another route farther north. Edouard Umfreville was sent to explore the country west of Lake Nipigon in 1784, and actually found a practicable route, which will be referred to presently. In 1798, however, Roderick McKenzie, returning to Grand Portage from the West, accidentally learned from a party of Indians of a water communication leading from Lake La Croix to the mouth of the Kaministikwia. He followed it to Lake Superior, and as a result the North West Company moved its establishment from Grand Portage to the mouth of the Kaministikwia, where Fort William was built in 1801. Up to the time of McKenzie's discovery, or rediscovery, of the Kaministikwia route, it seems to have been unknown to the North West Company.[1]

The third route from Lake Superior to Rainy Lake, or Rainy River, was by way of the St. Louis River. It is not known definitely when this route was first discovered, or used, but in an unpublished memorandum by David Thompson, for many years astronomer of the North West Company, and later astronomer and surveyor under the sixth and seventh articles of the treaty of Ghent, he indicates that the route by way of St. Louis River, Vermilion River, and Lake Namakan, was a thoroughfare of the fur traders before 1783. A later route led from St. Louis River through various lakes and rivers to the Big Forks, and down that tributary to Rainy River. It is referred to in Keating's *Narrative*, and must have been in use at least as early as 1807, as a detailed description of it is given in that year by George Henry Monk of the North West Company, in his "Account of the Department of Fon du Lac or Mississippi," an unpublished manuscript in the archives of McGill University, Montreal.

[1] Burpee, "Canoe Routes from Lake Superior to the Westward," Geographical Journal, August, 1910.

These three routes, by way of the Kaministikwia, Grand Portage, and St. Louis River, led to Rainy River and the Lake of the Woods. The fourth route was farther to the north, and did not touch Rainy Lake or the Lake of the Woods. It ran from Lake Superior up the Nipigon River to the lake of the same name, then westward by various rivers and lakes to English River, and down that stream to the Winnipeg River. It was discovered by Umfreville in 1784, and although a practicable route, was never much used by the fur traders.

Having described the three main routes that connected Lake Superior with the Lake of the Woods, a few words may be said as to the routes from the Lake of the Woods to Lake Winnipeg and the Red River. The principal route was, of course, the Winnipeg River, which was generally used throughout the period of exploration and the fur trade, in spite of the difficulties of its navigation. It appears, however, from the Journals[1] of La Vérendrye that he discovered and used to some extent another route from the Lake of the Woods to Red River, by way of Reed River and Roseau River. La Jemeraye and one of the sons of La Vérendrye had followed the Winnipeg River route in the winter of 1732–33, and built a fort near the mouth of that river. A year or two later the elder La Vérendrye discovered the Roseau River route, but there is no evidence that he made much use of it, or that it was followed by later explorers or fur traders.

These were the only water routes, but there was for some years a land route between the Lake of the Woods and Red River. In his Report of 1859,[2] S. J. Dawson recommended to the Canadian Government the opening of a road from Lac Plat (now Shoal Lake, at the western extremity of Lake of the Woods) to the Red River, a distance as he stated of 91½ miles. This recommendation was not adopted, but the so-called Dawson Road was subsequently built from the northwest angle to Red River.

All the water routes east and west of the Lake of the Woods involved many portages, for which the birch-bark canoe of the Indian was specially adapted. The method of carrying goods over a portage, or "making a portage" as it was called, is interestingly described by John Johnston, in his "Account of Lake Superior":

> Carrying the canoes, goods, and provisions (across a portage) is done by means of leather straps or thongs, the middle of which is broad and fitted to the forehead of the carrier. The first bale or piece is tied so as to lie a little above the *reins*, the second is lifted over the head and deposited, without tying, on the first, and, thus loaded, the *engages*, as they are called, trot off to the place chosen for a deposit, which they call a *pose*, and which in large portages are from 2 to 3 miles apart. This they repeat till the whole is transported; they then set off for the canoe, which they carry on their shoulders. They so go

[1] "Journals of La Vérendrye," Champlain Society, Toronto.

[2] Report on Exploration of the Country Between Lake Superior and the Red River Settlement, p. 28.

on till night, only stopping once for their meal, and once or twice for lighting their pipes. The packs are from 80 to 120 pounds weight, and he is not looked upon as "a man" who can not carry two; there are many who even take three and outrun their fellows. This is the mode of carrying all over the Northwest; to the southward they use horses.[1]

It appears from the journals of Anthony Hendry, Matthew Cocking, and others, that in their early expeditions inland from Hudson Bay, the men of the Hudson's Bay Company, like their rivals of the North West Company, made use of the Indian birch-bark canoe. In 1823, when Major Long and his party traveled through the Lake of the Woods and Rainy Lake the Hudson's Bay Company was still using canoes on those waters. Paul Kane traveled with a brigade of Hudson's Bay Company canoes from Fort William to Lake Winnipeg in 1845, but in returning the following year, the brigade from Norway House to Fort Frances consisted of York boats,[2] which he describes as about 28 feet long and strongly built, so as to be able to stand a heavy press of sail and rough weather. They often carried 80 or 90 packs of 90 pounds each, and had a crew of seven men—a steersman and six rowers. The York boat was probably introduced on the Lake of the Woods waters a few years before Kane's journey. What was practically the same type of boat is described by Captain Butler[3] in 1870 in his journey from Rat Portage to Fort Frances:

The boat in which I now found myself was a large, roomy craft, capable of carrying about 3 tons of freight; it had a single tall mast carrying a large square lugsail, and also possessed of powerful sweeps, which were worked by the men in standing positions, the rise of the oar after each stroke making the oarsmen sink back upon the thwarts only to resume again his upright attitude for the next dip of the heavy sweep. This is the regular Hudson Bay Mackinaw boat, used for the carrying trade of the great fur company on every river from the Bay of Hudson to the Polar Ocean. It looks a big, heavy, lumbering affair, but it can sail well before a wind, and will do good work with the oars, too. * * * My crew numbered seven hands.

These York boats, or Mackinaw boats, of the Hudson's Bay Company were therefore also the first sail boats on the Lake of the Woods. Many years after another type of boat was introduced on the same waters by the lumbermen, in the form of a scow. Archibald Blue describes some of these "wannigans," as they were known on Rainy River. They were large scows covered over with lumber like shanties and were used by lumbermen when driving logs in the spring, and also by the Government road contractors for the cooks, being moved down stream as the work progressed. A similar type of flatboat is used by the lumbermen of Maine and New Brunswick, and is known as a "wangan" or "wangan boat."

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[1] Masson, "Bourgeois de la Compagnie du Nord-Ouest, II, p. 165. See also McLeod's notes on portaging, in Peace River, pp. 57, 61.

[2] Strongly built boats named after York Factory, one of the principal posts of the Hudson's Bay Company on Hudson Bay.

[3] The Great Lone Land, p. 155.

a, LIFT BRIDGE ABOVE INTERNATIONAL FALLS.

b, KOOCHICHING FALLS DAM.

The first steam vessels on Rainy Lake, Rainy River, and the Lake of the Woods seem to have been built in the years 1871 or 1872. In his narrative of Fleming's overland expedition of the latter year,[1] George M. Grant says:

> Eighteen miles, broken by two short portages, brought us about midday to Rainy Lake. Here we were told, but as it turned out incorrectly, was the last steam launch that could be used on our journey, as the two on Rainy Lake and Lake of the Woods had something wrong with them. At 3 p. m., at the cry of "all aboard," our flotilla formed at once, the steam launch towing two large barges with the emigrants and their luggage, and the four canoes. * * * By 9 o'clock, we had made only 30 miles. Our steamer was small, the flotillas stretched out far, and the wind was ahead. * * * At Fort Frances the hulls of two steamers, to be over 100 feet in length, for use on Rainy River and the Lake of the Woods, are now being built.

From Fort Frances the flotilla was towed down Rainy River by another of the small steam launches built by the Canadian Government. They stopped at the small post of the Hudson's Bay Company, known as Hungry Hall, near the mouth of the river, and then crossed the Lake of the Woods to the Northwest Angle Inlet. A thunderstorm on the lake forced the captain of the steam launch to seek shelter in a small bay of one of the islands. From the head of the inlet, Fleming's party made their way overland, by what was known as the Dawson Road, to Winnipeg.

From other sources it appears that this small steam launch or tug, the first to navigate the waters of the Lake of the Woods, was of 3 or 3½ feet draft. Her name, if she ever had one, has not survived. In 1873 the Government built another small boat for the same service, and in the same year constructed a more ambitious vessel, a side-wheeler, known as the *Lady of the Lake*, with draft of 5 feet, tonnage 150. She ran between Fort Frances and the Northwest Angle. In 1876 the first privately owned boat on the Lake of the Woods was built. She was called the *Speedwell*, draft 4 feet, tonnage about 20, and was engaged for some years in passenger and freight traffic between Fort Frances, the Northwest Angle, and Rat Portage. The *Speedwell* was wrecked on Wileys Reef in 1882. From 1876 regular traffic by steamboat was opened to Portage Bay. In 1879 or 1880 the Canadian Government built the *Lily of the West*, a boat of the screw-propeller type. She was portaged from Namakan Lake, and used in carrying supplies from Rat Portage to Ash Rapids and Big Stone Bay. Her draft was 4 feet, and tonnage 25 or 30. Two other vessels built about the same time were the *N. Mosher* and the *Lily McAuley*. The former, built and owned by Capt. Hooper, ran on the same route as the *Speedwell*. Her draft was 5½ feet, tonnage about 20. She was wrecked about 1885 at mouth of Rainy River. The latter was a side-wheeler of 7 or 8 foot draft and tonnage of 97.

[1] Ocean to Ocean, pp. 45–48.

Her machinery was transferred from the *Lady of the Lake*. She was used for towing logs about the Lake of the Woods. She was renamed *Mary Hatch* in 1884, and changed to screw propeller in 1886. For names and other particulars of boats launched since 1880, see Appendix.

These boats were used, some for passenger traffic, some for freight, and many for both. Many have been engaged in towing lumber, and quite a number of the smaller craft in connection with the fisheries. As a result of the mining boom in the Lake of the Woods district a few years ago, many boats of small tonnage were put in commission for the transport of supplies. Some idea of the local traffic on Rainy River is gained from Blue's "Tour of Inspection in Northwestern Ontario,"[1] 1895. He descended the river in the *Edna Brydges*, built that year:

> The *Edna Brydges* left Fort Frances at 7 o'clock in the morning, and at 9.30 we got on board of her at Holmes's dock. Toward noon a windstorm came up the river, which increased steadily in force until it became a furious gale. There is a fair amount of traffic on the river; almost every farmer has a dock of his own; and wherever passengers or freight are to be taken on or landed, the boat is accommodating enough to call. But the wind and waves made it a hard task on this trip, and repeated attempts had to be made in many cases, before the boat could be brought in to tie up at the dock. It was 8.30 before the mouth of the river was reached. * * * The boat left for Rat Portage at 6 o'clock Saturday morning, with the wind still high. We took up a party of excursionists from a fishing boat in a bay upon the east side of the lake, near to one of the numerous sand banks there; and the water being only 6 or 7 feet deep, with the waves rolling high, the keel of the *Edna Brydges* bumped over and over again upon the sand bottom.

The boat took nine and a half hours to make the trip from the mouth of Rainy River to Rat Portage, the distance being given as 72 miles.

No survey of the question of transportation on the Lake of the Woods and tributary waters would be complete without some consideration of actual or projected schemes for the improvement of navigation in these waters. In Sir George Simpson's "Journey Around the World" there is a glowing description of Rainy River, in which the writer offers this propheey:

> Is it too much for the eye of philanthropy to discern through the vista of futurity this noble stream, connecting as it does the fertile shores of two spacious lakes, with crowded steamboats on its bosom and populous towns on its borders?

It has been said that the entertaining narrative of Sir George Simpson's journey was actually written by Recorder Thom, of the Red River Settlement. However this may be, Sir George Simpson found his very optimistic statements as to the adaptability to settle-

[1] Report Bureau of Mines, Ontario, 1895, p. 167.

ment of the Lake of the Woods country, as well as the western prairies, rather embarrassing when he was called upon to give evidence before the select committee of the British Parliament on the Hudson's Bay Company.[1] He was then in the position of defending the fur company, whose policy was to discourage settlement in their territories in every possible way. When, therefore, passages from his book were read to him, such as that relating to the Rainy River, he promptly stated that he had vastly overrated the importance of the region as a country for settlement.

The same select committee examined one William Kernaghan, who had something to say as to an ambitious project for the improvement of navigation between Lake Superior and Red River. This was in 1857. Kernaghan read an extract from a Chicago newspaper of that year to the following effect:

> In the senate of Michigan, General Cass presented the petitions of Jean Lafever, Robert Mallon, and Alexander McLain, asking for a Government exploration and survey of the Pigeon and Arrow Rivers, of Lake Superior, and of the route from the mouth of those streams or near them to Rainy Lake, on the United States boundary line, with estimates of the cost of so improving by locks and canals the communication between those waters so as to make a practicable navigation from the Lower Red River of the North via Lake Winnipeg to Lake Superior. They represent that, at a reasonable cost, the whole valley of the Red, Assiniboine, and Saskatchewan Rivers can be connected with the waters of Lake Superior.

The petitioners it appears were the owners of a line of steamboats plying on Lake Michigan and Lake Superior.

Other witnesses before the committee gave evidence as to the feasibility of creating a navigable waterway between Lake Superior and Red River, some, as Colonel J. F. Crofton, favorable to the project, and others quite the reverse.

Sir George Simpson was asked:

> Do any serious practical difficulties or impediments exist in making that navigation, which you have traversed with your canoe, a regular course of navigation?

He answered:

> I think there are insuperable difficulties, unless the Bank of England were expended upon the improvement of the country. Near the height of land there is no water; the rivers are shoal and the soil is bad. I think the difficulties are very great.

In his report to the Canadian Government in 1868 Mr. S. J. Dawson[2] seriously discusses the relative advantages and practicability of rail-and-water routes between Lake Superior and Red River. While admitting the great advantages of a railway, he dismisses it

[1] Report from the Select Committee on the Hudson's Bay Company. London, 1857.
[2] Report on the Line of Route Between Lake Superior and Red River Settlement, p. 26

as premature in view of the cost and the undeveloped character of the region. He recommends a combined rail-and-water route:

From the height of land portage (he says), where it strikes the Savane River, to the northwest angle of the Lake of the Woods, the distance is 304 miles, and the total amount of lockage that would be required, 425 feet, being somewhat less than that of the Rideau Canal.[1] By means of lock and dam, the whole of this distance might be rendered navigable without a break, at comparatively small cost, if wooden locks were adopted. The river channels between the navigable sections are everywhere of rock, and generally favorable, for the construction of such works as would be required.

With this extent of navigation might be connected the navigable water, east of the Height of Land, having a length in Dog Lake and River of 35 miles.

When the dam now in progress in Dog Lake is completed, the difference in level between the waters of Dog River and the Savane will be about 100 feet, and a canal with locks by way of Muskaig Lake might be constructed to connect the two. Lac des Mille Lacs would be the summit level, and it has sufficient water for a canal both ways. This would give 350 miles of unbroken navigation, approaching at its eastern extremity to within 25 miles of Lake Superior, and at its western to within 90 miles of Fort Garry.

All the lockage required would cost less than would a railroad of 200 miles to Rainy Lake, and it would be of vastly greater utility.

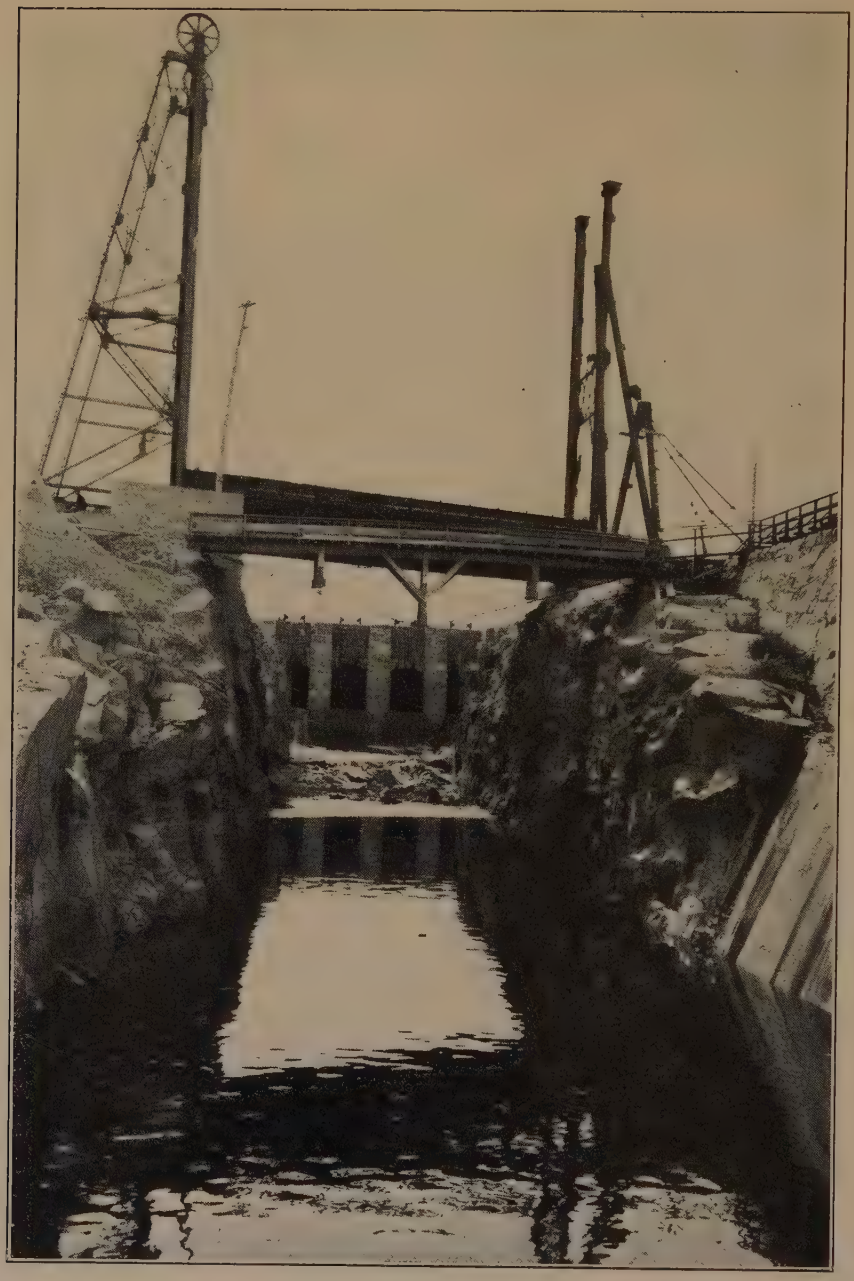
A short railway of 25 miles, from Dog Lake to Thunder Bay, would connect the navigation with Lake Superior, while a similar work of 90 miles, from For Garry to the Northwest Angle of the Lake of the Woods, would join it to the Red River Settlement.

Thirty-eight years later, the question of the canalization of the waters between Lake Superior and the Lake of the Woods was again under consideration. At the meeting of the International Waterways Commission held in Toronto in July, 1906,[2] Mr. J. G. Sing, engineer in charge of the Rainy River district for the Department of Public Works of Canada, submitted a written statement in opposition to the project of the Minnesota Canal and Power Company to divert the flow of certain waters forming the boundary between the United States and Canada. In his communication Mr. Sing says:

When we consider the vast energies and sums of money which have actually been spent, and which annually are being expended, by nearly all countries upon their internal waterways and canals, and when we consider also the chain of waters connecting—through many portages, it is true—Lake Superior with the west, it might be too hasty a conclusion for anyone to state that for navigation purposes, these waters might not be much improved. If such improvement is ever to take place, might it not require all the water naturally shedding from the territory through which this great waterway passes? Capitalists are reported to have already proposed the canalization of the waters lying between Lake Superior and Lake Winnipeg. In the particular territory under discussion, railway traffic through Fort Frances and Kenora could be better regulated if the waterways along the international boundary were kept open for the best water communication they were able to afford. * * *

[1] Rideau Canal built between 1826 and 1832, on advice of the Duke of Wellington, for military purposes, from Bytown (now Ottawa) to Kingston on Lake Ontario.

[2] Reports of the International Waterways Commission, p. 136.



CANAL AT FORT FRANCES.

In speaking of the canalization of the waters between Lake Superior and the Lake of the Woods, I find, upon reference to the report of the engineers who made the survey, that there are 311 miles of navigable waters between the summit near Lake Superior and the Lake of the Woods, and by the proper arrangement of a series of stop-log dams, and the construction of locks, these waters can be fully utilized for transportation purposes. The navigation as proposed would entail very little canal work, as the cutting would not amount to more than 1 mile in the entire distance of 311 miles. In the development of this route, there is, under the present natural conditions, plenty of water, if conserved judiciously, for feeders, but it would not be safe to allow a diversion of any portion of the flow in an opposite direction to that intended by nature. The total cost of opening up this route has been estimated at $1,500,000 by the engineers who made the survey. This waterway, if fully developed, would prove a safeguard against excessive rates being charged on any railways that might parallel it.

There is reason to suspect that Mr. Sing's estimate must have been based on very insufficient data.

The Canadian Government at one time seems to have contemplated the creation of some such system of waterways as outlined above, but apparently abandoned the project when private enterprise undertook to build the Canadian Pacific Railway[1] through the same territory. As part of such a project the Government commenced in the spring of 1875 the construction of a canal lock at Fort Frances on the Rainy River. This was practically completed, with the exception of the gates, at the close of 1878. The works were discontinued the following year, with the larger project, and the lock at present is in temporary use as a waste channel in connection with the power works of the Ontario and Minnesota Power Company. It may be noted that in approving the plans of the Rainy River Improvement Company, the United States corporation associated with the Ontario and Minnesota Power Company in the same power project, the United States Government reserved the right to construct a canal on the American side of the river, if that should become desirable at some future time.

In a memorandum dated May, 1911, one of the engineers of the Public Works Department of Canada gives the cost of the canal on the Canadian side as $288,278.51, and adds:

If completed it would afford navigation from the Rainy Lake waters to the Long Sault Rapids, 40 miles below Fort Frances. Together with a lock at the Long Sault, which is under consideration, it would afford navigation at all times between Rainy Lake and Lake of the Woods, a distance of about 180 miles.

In regard to the project mentioned above, of a lock at the Long Sault Rapids on Rainy River, a report by Mr. J. W. Fraser, an

[1] Charter granted by Dominion Parliament in 1881.

engineer of the Department of Public Works of Canada, dated April 20, 1900, contains the following:

> Rainy River * * * has been navigated for a number of years under difficulties and dangers occasioned by the existence of two rapids situated about midway of its course, and by the shallowness of the upper stretch above the rapids at low water. A number of boats and loaded barges have already been either totally wrecked or considerably damaged in this river. The increasing * * * has impressed this department with the importance of improving this stretch of river, which forms part of a shipping highway extending from Rat Portage on the Canadian Pacific Railway to Mine Center on Rainy Lake, a stretch of over 200 miles. This navigation is interrupted only at the falls of Fort Frances, where a transfer of cargo has to be made. The improvements contemplated consist in the construction of a dam, between the banks of the river, at the foot of the rapids to obliterate both of them, and raise the water level 2 feet at the foot of the falls at Fort Frances; and to maintain the communication by the construction of a lift lock at the extremity of the dam on the Canadian side. The lock is to be built of concrete masonry; and the dam of timber, built to a sufficient height to raise the water level 11 feet at extreme low water.

In view of the fact that Rainy River is an international stream, and that the project of a lock at the foot of the Long Sault Rapids would involve the erection of a dam from the Canadian to the American shore, the Canadian Government referred the matter for report to the International Waterways Commission. The United States members of that commission feeling that they had no jurisdiction to deal with such a question, the report was made by the Canadian section of the commission under date of December 18, 1907. In this report, after describing the physical characteristics of Rainy River and the Long Sault and Manitou Rapids, the character of the works proposed to be built by the Canadian Government, and the probable effect of the dam on the river above and below, the commission concludes:

> After considering the project no objection can be seen to the proposed improvement; on the contrary it has much to recommend it. This section, therefore, respectfully recommends that the Canadian Government request the Government of the United States to grant them the permission to carry out the proposed works.[1]

In an order in council dated May 6, 1907, it was stated that the Canadian Parliament at its last session had provided $50,000 toward the commencement of the proposed work. All that remained, therefore, was to obtain the consent of the United States Government, which, of course, was essential, as one end of the dam must rest on American territory.

The question was brought to the attention of the United States Government, through the British Embassy, in May, 1908. The War Department reported favorably upon the project, but in a communi-

[1] Compiled Reports of International Waterways Commission, 1905–1913, pp. 633, 634.

cation from the United States Department of State, dated June 10, 1909, it is said:

> In response to a request for an opinion on the subject by the Attorney General, I am advised by him that under existing congressional legislation no one is authorized to give consent for the United States for the construction of the dam in question, and that the dam can not be constructed as proposed without the consent of Congress. Among various modes of procedure it has been suggested that the Canadian Government might undertake the construction of the portion of the dam on the American side of the river through a corporation organized under the laws of the State of Minnesota.

There the matter seems to have rested, so far as the two Governments were concerned. The suggestion contained in the letter of the United States Secretary of State as to the possibility of the work being carried on by a private corporation seems, however, to have led to the organization of a company known as the Western Canal Company, incorporated by act of Parliament of Canada, dated May 19, 1911, chapter 149. By its act of incorporation the company is authorized to "construct, maintain, and operate a canal and navigable connecting channels from a point 5 miles east of Fort Frances on Rainy Lake, by way of the Rainy River, to a point 5 miles west of the foot of Long Sault Rapids on the said river." It is also empowered to construct, maintain, and operate all necessary locks, dams, etc. The proposed works must be approved by the "Waterways Commission" (International Joint Commission), as well as the Minister of Railways and Canals of Canada and the Governor in Council. The Canadian Government also reserves the right to take over the works at any time on due compensation.

In its statement in response to the application of the Watrous Island Boom Company, filed with the International Joint Commission in April, 1912, the Western Canal Company states that it is seeking the necessary legislation from the Government of the United States and the State of Minnesota to complete its authorization.[1] Apparently, however, the company failed to secure this legislation from the United States, or decided, for other reasons, to drop the project. In any event, it took no steps toward building a dam or lock at Long Sault.

In this connection it should be noted that in the concessions the Dominion Government has granted for power projects on the Winnipeg River, in the Province of Manitoba, definite provision has been made for the alteration of these works to conform to a future canalization scheme. Furthermore, the Government in its comprehensive scheme of power development covering that portion of the river now undeveloped (which will be referred to later under the division of power development) has provided a combined power and canaliza-

[1] Decision and order of approval Watrous Island Boom Company, p. 32.

tion scheme. Not only, therefore, has it been provided that all existing works must be altered to conform to a future possible canalization project, but that all new schemes must be constructed in such a way that the navigation features of the river will be preserved.

In the several volumes of testimony taken by the commission in the years 1912, 1915, and 1916 will be found a great deal of information as to the interests of navigation on Rainy Lake, Rainy River, the Lake of the Woods, and the Winnipeg River, and the effect on those interests of the maintenance of various suggested levels in the Lake of the Woods. Attention is particularly drawn to the evidence offered on behalf of the Rainy River Navigation Company at the 1912 hearings.

Generally speaking, it may be said that steam navigation on the Lake of the Woods, Rainy River, and Rainy Lake dates from the building of the Dawson Road by the Canadian Government in the early seventies, and developed rapidly through the eighties and nineties as a result of a mining boom, the growth of the lumbering industry and fisheries, and the increase of population. Its decline may be said to date from the opening of the Canadian Northern Railway between Port Arthur and Winnipeg, which runs through this district. Water transportation will no doubt revive again as the country becomes more thickly settled and the demand increases for water transport between points on the Lake of the Woods, Rainy River, and Rainy Lake.

At the various hearings held by the commission in connection with this investigation testimony was obtained from the engineers of the United States and Canadian Governments as to works carried out, or in contemplation, for the improvement of navigation in these waters.[1]

From this testimony, as well as from the official records, it appears that the Corps of Engineers of the United States Army has been engaged for some years past in the improvement of Warroad Harbor and River and Zippel Bay on the south shore of Lake of the Woods. In his testimony at Warroad in 1915, Major Ernest D. Peek, of the Corps of Engineers, stated that the first item for improvements at Warroad was inserted in the river and harbor bill in 1899; that actual construction work commenced in 1902; has been in progress continually since that date, and is now practically completed. The total expenditure, as given in the report of the Chief of Engineers for 1915 (pt. 1, p. 1048) was $113,921.78 to June 30, 1915.

The work at Zippel Bay consists of a breakwater and dredging, which was commenced in 1912, and up to June 30, 1915, has cost $28,554.91.

[1] Hearings re Levels of the Lake of the Woods, 1915, p. 35.

Reports have also been made at various times on proposed improvements at Arnesen, on the south shore of the Lake of the Woods, at the mouth of Rainy River, on Rainy River, and on Rainy Lake, but it was decided not to carry out any of these projects until conditions would warrant the expenditure.

The improvements to navigation on the part of the Canadian Government have consisted mainly of dredging at the mouth of Rainy River. At the 1915 hearings Mr. F. Y. Harcourt, of the Department of Public Works of Canada, stated that the total expenditure by his department on dredging and other improvements in the Lake of the Woods, Rainy River, and Rainy Lake, between 1907 and 1915, amounted to $270,858.84.[1]

At the Kenora hearing in 1915 it was brought out in evidence that the value of steamboats running out of Kenora amounted to something over $300,000. There are also about 450 gasoline launches on the Canadian side of the Lake of the Woods valued at $320,000. The investment in dockage at Kenora and Keewatin amounts to $185,000.

There are at present three vessels of United States register plying on these waters, the *Explorer* (gross tonnage, 18), built in 1910, and *Koochiching* (22), built in 1909, on Rainy Lake, and the *Isabel* (30), built in 1910, on Lake of the Woods.

[1] Hearings re Levels of the Lake of the Woods, 1915, p. 452.

XI.—RECREATION.

It would be difficult to overestimate the value of the Lake of the Woods and its tributary waters as a summer resort for tourists and as an ideal resting place for tired city workers. Railway communication makes it conveniently accessible from Winnipeg, St. Paul, Minneapolis, Duluth, Fort William, and Port Arthur, and even from urban centers farther afield. The climate is ideal. The lakes contain thousands of picturesque islands on which summer homes may be built; their waters offer a variety of game fishes; moose, deer, and other wild life abound; and the tourist or summer cottager has at his command every variety of boating. Many have already discovered the possibilities of the region, and in the years to come very many more will follow their example.

The progress of settlement has hitherto been so gradual that one can still find in the Lake of the Woods the wild beauty and charm of a spot utterly remote from civilization. There are innumerable islands in the lake on which one might build a summer home, with the certainty that no suggestion of the outside world would obtrude itself uninvited.

Even the usually rather prosaic and unemotional fur traders were impressed with the rare beauty of this lake of islands. Alexander Henry, Sir George Simpson, and others who have left narratives of their journeys through these waters, have united in praise of the scenic and other attractions of the region.

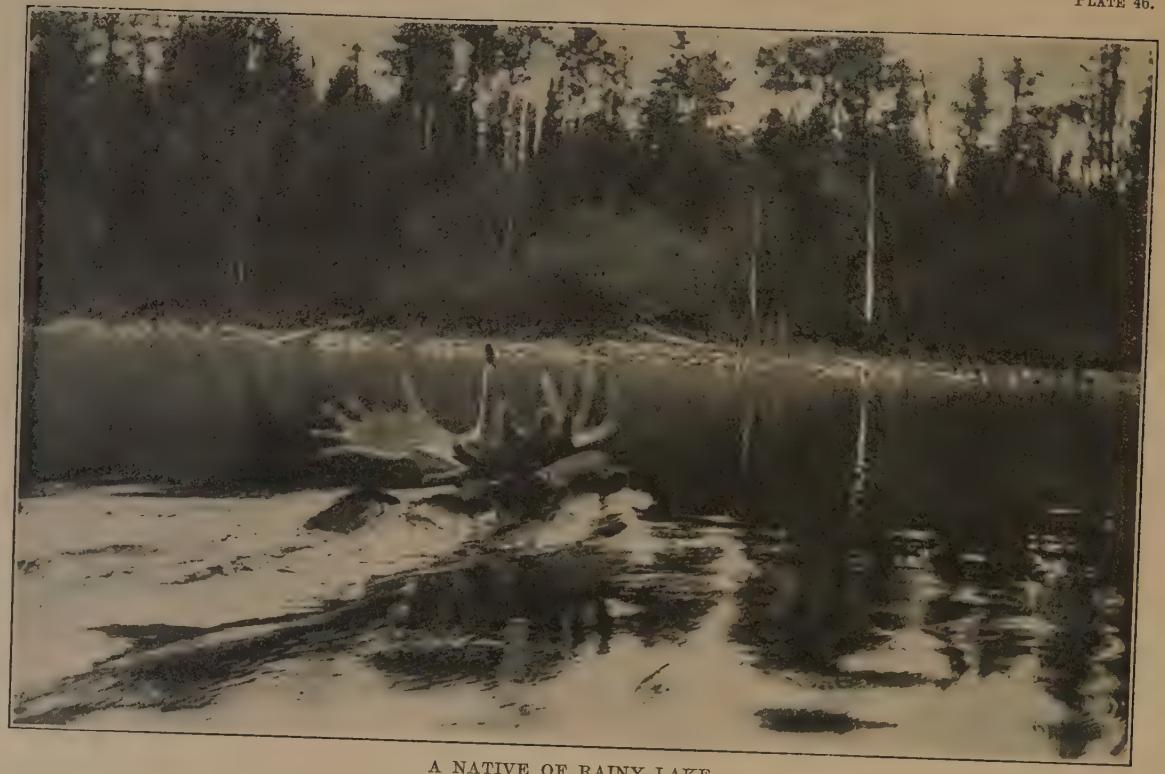
Paul Fountain,[1] an English scientist, who crossed the Lake of the Woods in 1865, says:

> To reach Rat Portage House we had crossed the Lake of the Woods, and this was, to my mind, the most enchanting piece of water we had yet passed over. The thousands of islets that crowd the bosom of this lake, rocky and clothed thickly with pines, and trees of feathery foliage; the bold, rocky shores, rising to mountainous heights, and reflected in the smooth, glasslike waters, made up a scene that for beauty and sublimity I had not hitherto seen the like of in this country.

W. F. Butler,[2] among later writers, gives the following description of the scenery of the Lake of the Woods, a description which will appeal to anyone who has traveled by water through this wonderfully picturesque region:

> That portion of the Lake of the Woods through which we now steered our way was a perfect maze and network of island and narrow channel; a light

[1] The Great Northwest and the Great Lake Region of North America, p. 74.
[2] Great Lone Land, p. 156.



A NATIVE OF RAINY LAKE.

breeze from the north favored us, and we passed gently along the rocky islet shores through unruffled water. In all directions there opened out innumerable channels, some narrow and winding, others straight and open, but all lying between shores clothed with a rich and luxuriant vegetation; shores that curved and twisted into mimic bays and tiny promontories, that rose in rocky masses abruptly from the water, that sloped down to meet the lake in gently swelling undulations, that seemed, in fine, to present in the compass of a single glance every varying feature of island scenery. Looking through these rich labyrinths of tree and moss-covered rock, it was difficult to imagine that winter could ever stamp its frozen image upon such a soft summer scene. The air was balmy with the scented things which grow profusely upon the islands; the water was warm, almost tepid, and yet despite of this the winter frost would cover the lake with five feet of ice, and the thick brushwood of the islands would lie hidden during many months beneath great depths of snow.

A quarter of a century earlier, R. M. Ballantyne,[1] who was then in the employ of the Hudson's Bay Company, crossed the Lake of the Woods by canoe from Rat Portage to the mouth of Rainy River, and it may be worth while to quote what this once well-known writer has to say of the scenery:

There is nothing, I think, better calculated to awaken the more solemn feelings of our nature (unless, indeed, it be the thrilling tones of sacred music) than these noble lakes, studded with innumerable islets, suddenly bursting on the traveler's view as he emerges from the somber forest rivers of the American wilderness. The clear unruffled water, stretching out to the horizon—here embracing the heavy and luxuriant foliage of a hundred wooded isles, or reflecting the wood-clad mountains on its margin, clothed in all the variegated hues of autumn; and there glittering with dazzling brilliancy in the bright rays of the evening sun, or rippling among the reeds and rushes of some shallow bay, where hundreds of wild fowl chatter as they feed, with varied cry, rendering more apparent rather than disturbing the solemn stillness of the scene; all tends to "raise the soul from nature up to nature's God," and reminds one of the beautiful passage of Scripture, "O Lord how manifold are Thy works! In wisdom hast Thou made them all; the earth is full of Thy riches."

S. J. Dawson[2] in his Report on the Red River Expedition, 1859, also has something to say about the Lake of the Woods:

It would be difficult to conceive anything more beautiful of its kind than the scenery of this lake. Islands rise in continuous clusters and in every variety of form. Sometimes in passing through them the prospect seems entirely shut in; soon again it opens out and through long vistas a glance is obtained of an oceanlike expanse, where the water meets the horizon. Not a trace of civilization is anywhere observable, but the Indians are numerous, and, indeed, this lake seems to be their favorite resort in summer, the wild rice on its borders, and the fish which abound in its waters, affording them an easy means of subsistence, not to mention the maize which they grow on the islands.

[1] Hudson's Bay, pp. 271, 272.

[2] Dawson. Report on the Exploration of the Country Between Lake Superior and the Red River Settlement, pp. 13, 14.

In addition to its picturesque qualities, a certain romantic interest is lent to the Lake of the Woods by its intimate association with the Indians and their legends.

Says Butler:[1]

Among the Indians the lake holds high place as the favorite haunt of the manitou. The strange water-worn rocks, the islands of soft pipestone from which are cut the bowls for many a calumet, the curious masses of ore resting on the polished surface of rock, the islands struck yearly by lightning, the islands which abound in lizards, although these reptiles are scarce elsewhere—all these make the Lake of the Woods a region abounding in Indian legend and superstition. There are isles upon which he will not dare to venture, because the evil spirit has chosen them; there are promontories upon which offerings must be made to the manitou when the canoe drifts by their lonely shores; and there are spots watched over by the Great Kennebie, or Serpent, who is jealous of the treasures which they contain.

Of the Indians of the Lake of the Woods, as they were in 1859, S. J. Dawson has this to say:

They are a fine looking race, and if removed from the humanizing influences of civilization, they are also strangers to the vices which it brings. The men are generally tall and well formed, and some of the women remarkably comely, but they are not very cleanly in their habits, and there can be nothing more suggestive of indolence than their mode of life, which, however, has one feature to recommend it in the entire exemption from care with which it seems to be attended. Gliding in their light canoes from island to island, basking in the sunshine on some pebbly strand, and merely exerting themselves to an extent sufficient to supply their immediate wants, the future affects them not and they appear to be supremely happy; but the winter brings its troubles, and they have then to betake themselves to the forests in single families, where, having only game to depend upon, they are sometimes sadly straitened.

Peter Grant, of the Northwest Company, was present as a guest at one of the religious ceremonies of the Chippawa, at their camp on Rainy River, about the end of the eighteenth century, and has left a curious account of what took place in his narrative, "The Sauteaux Indians." The account is too long to quote, but will be found in the second volume of Masson's Le Bourgeois de la Compagnie du Nord-Ouest, pages 358–361.

In a statement forwarded to the commission by the Kenora Board of Trade, the following is said as to the tourist interests:

The possibilities for the development of the tourist traffic on the Lake of the Woods are almost unlimited. The beauty and general attractiveness of the lake, with its myriad islands, are assets which compel the attention of every visitor, and the number of people who frequent its shores is increasing yearly. During the past season (1913) the number of American tourists who came to the lake was many times that of any previous year, and now that good railway service is established at International Falls and Fort Frances on Rainy River, and at Warroad, with all points to the south, the tourist traffic will increase very rapidly. In a short time it will undoubtedly become the leading factor in the trade of this section.

[1] Great Lone Land, p. 159.

A HUNTER'S PARADISE.

At the various hearings evidence was offered both as to the advantages of the Lake of the Woods country as a tourist resort and home for summer cottagers, and as to the extent to which these advantages had already been availed of, particularly by residents of the city of Winnipeg. At the Warroad hearings in 1912, Mr. George A. Ralph, drainage engineer of the State of Minnesota, said, in answer to a question as to the importance of maintaining the navigability of the Rainy River:

> I believe it is very important. I believe the Lake of the Woods in time to come will be recognized as one of the beauty spots on the continent, one of the most beautiful lakes in America, and that it will attract tourists from all over the world, and it will be highly important to keep open navigation on the Rainy River as far as Fort Frances.

At the Kenora hearing in 1915, Mr. S. S. Scovil, engineer of the Lake of the Woods technical board, Canada, gave the commission very full information as to the present extent of tourist traffic in the northern waters of the Lake of the Woods. He said that the tourist season covered about three months of the summer; that from 2,000 to 2,500 people, principally from Winnipeg, used the lake as a summer resort; that they occupied many of the islands and portions of the northern shore; that some of them lived in summer cottages and some in camps; that these tourists had already expended about a quarter of a million dollars in launches; $191,000 in boathouses, and $34,545 in docks. This was up to the close of the season of 1913. To illustrate the almost illimitable possibilities of the Lake of the Woods as a tourist resort, Mr. Scovil pointed out that there were at least 10,000 islands in the lake available for summer homes, only a very small fraction of which were at present occupied.

Mr. Donald H. Currie, at the same hearing, testified that the tourist traffic dated back to about 1890. He also mentioned that there were two large summer camps near Kenora, one maintained by the Young Men's Christian Association and the other by the Methodist Literary Association, both of Winnipeg. They camped on the islands, and each had from 200 to 300 campers throughout the summer season. The Canadian Pacific Railway each week throughout the season brought out about a thousand people from Winnipeg for the week-end.

Further evidence as to the use of the Lake of the Woods and waters flowing into and from that lake by tourists was obtained at the 1916 hearings in Winnipeg. (See pp. 227–261, and 276–281.) The latter refers to a colony of campers on the Winnipeg River, known as the Minaki Campers' Association.

In this connection, a few words may be said as to game animals in the Lake of the Woods region. Of the larger wild game the moose and red deer frequent the unsettled portions. Caribou, which is

found on certain of the islands of the Lake of the Woods and in other localities on the Canadian side, are rarely found in the United States. The fur-bearing mammals are numerous in the less frequented areas and a considerable business in fur trapping is still being carried on there. In Lake, Cook, and St. Louis Counties fur farming has been undertaken by a number of individuals. The black, cross and red fox, mink and skunk, are generally raised. This industry is increasing steadily and, utilizing land ill-fitted for other purposes, will in time assume considerable proportions.

XII.—POWER DEVELOPMENT.

One of the most important uses to which the waters of the Lake of the Woods and the waters flowing into and from that lake have been put, is the development of power. It is a fortunate circumstance that this region, with its varied resources, should possess as well water powers capable of economical development to an extent of over half a million horsepower. It is an equally significant fact that the use of this power is no longer confined to the vicinity of the power sites, but under modern methods of high voltage transmission may be used in connection with the industrial development of many comparatively remote communities.

As Mr. J. B. Challies, superintendent of the Dominion Water Power Branch, says in a recent report:

> Historically considered, the utilization of our power resources has passed through three distinct phases. The first pertained to the production of power directly and from natural sources as water and wind, and its use was necessarily limited to their location. Early manufacturing communities were consequently grouped about easily available water-power sites. This phase might be called the water-power period in manufacturing industries.
>
> The second phase was characterized by the gradual development of the steam engine which rendered possible the utilization of fuel as a source of power, and at locations where it was required. During this period the development of coal mines and the rapid extension of railway systems imparted a tremendous stimulus to commercial and industrial enterprise. Proximity of water powers was no longer the controlling factor, and industrial communities were established wherever availability of raw material, labor, transportation facilities, market, and fuel power would allow.
>
> The third phase of power development in this country synchronizes with the advancement of the art of high-voltage transmission which permits the development of power generated by water or by steam at the most convenient and economical points, and its transmission many miles away to the desired location of use, in a form adapted to a great variety and convenience of use.

With the exception of the water power developed on the Rainy River, at the towns of International Falls and Fort Frances, and a number of undeveloped sites in the upper parts of the watershed, the bulk of the power, both developed and capable of development, now under consideration, lies on the Winnipeg River, and therefore both outside the watershed and entirely in Canadian territory. Since the year 1911, the Dominion Water Power Branch has been carrying on careful power surveys of the Winnipeg River. The results of these surveys have been embodied in a series of valuable reports. From these reports it appears that at nine distinct power sites on

the Winnipeg River, by means of suitable storage on its upper waters, it is possible and economically feasible to develop over 420,000 continuous 24-hour horsepower. Of these nine possible power sites, three are now under development, representing a total power capacity of 200,000 24-hour horsepower. One site is completely developed by the Winnipeg Electric Railway Company on the Pinawa Channel, and produces about 28,000 horsepower. Another site at Point du Bois Falls, developed by the city of Winnipeg, produces at the present time about 25,000 continuous horsepower, but is capable of extensions to a maximum of 77,000 24-hour horsepower. Development at the third power site at Du Bonnet Falls, having a maximum possible development of 95,000 24-hour horsepower, has been commenced by the Winnipeg River Power Company.

There is therefore at the present time about 53,000 continuous horsepower produced on the Winnipeg River, and transmitted for use in and around the city of Winnipeg, which can, with the two present plants and that at Du Bonnet Falls, be increased to 200,000 24-hour horsepower. The six remaining sites are under the control of the Dominion Government, and can furnish a further amount of 24-hour power to a maximum extent of 218,000 horsepower. This refers only to power sites on that portion of the Winnipeg River lying within the boundaries of the Province of Manitoba. There are, in addition, several important power sites on the Winnipeg River within the Province of Ontario; that is, between the point where the river empties out of the Lake of the Woods and the point where it crosses the Manitoba boundary.

In the report already alluded to Mr. Challies indicates very clearly the importance of the comprehensive system of development, which the Dominion Government has in view, in connection with the Winnipeg River. It may be explained here that the water powers of the Winnipeg River in the Province of Manitoba are controlled by the Dominion, while those in the Province of Ontario are controlled by that Province.

Mr. Challies says:

> Development under the immediate direction of the Government makes certain the fullest possible utilization of the power possibilities of each stream, whereas development by private enterprise almost invariably involves waste of natural resources. Private capital is seeking the greatest possible immediate return on investment and naturally confines its attention to the most concentrated and easily developed portion of any stretch of a river. The least precipitous portions of the river above and below a concentrated stretch involving a large unit outlay in development are consequently apt to be neglected and permanently wasted, because no other enterprise is likely or able to undertake the subsequent development. On the other hand, the Government, with its greater power and scope, can compel the construction of the more extensive works necessary to develop to the fullest feasible extent so that every foot-pound

WHITE DOG RAPIDS.

of energy represented by the falling waters of the Province may be given up when necessary to the service of man.

The prime reason for the exercise of Government authority over the control of stream flow for power development, is that under modern social and economic conditions, this step is necessary to insure the equal participation of all citizens in this form of natural wealth which is peculiarly the heritage of the whole people.

The first power installation on the Winnipeg River[1] was undertaken some 40 years ago at Pine Falls. Advantage was taken of the rock and shore formation on the left river bank to blast a power raceway for the purpose of carrying the headwater level to a lumber and shingle mill located some 900 feet below. A head of about 9 feet was available. No diversion was constructed in connection with the headrace, the natural shore line providing of itself all the facilities necessary in this direction. The mill was in continuous operation for about 13 years, when it was shut down, and some 5 or 6 years later destroyed by fire.

Of the three sites under development the earliest is that of the Winnipeg Electric Railway Company on the Pinawa Channel. The hydroelectric development at this point was first undertaken by the Winnipeg General Power Company, organized in 1901. The Winnipeg Electric Railway Company[2] was incorporated in 1904, and amalgamated the interests of the Winnipeg General Power Company with those of the Winnipeg Electric Street Railway Company. The general scheme called for the diversion into the Pinawa Channel of a portion of the Winnipeg River flow, by means of diversion weirs across the main channel, and the concentration and development of a 40-foot head. Operations on the excavation of the dam and tailrace began in the spring of 1902, and the construction of the plant was practically completed in June, 1906, at a cost of approximately $3,055,000. Transmission lines and substations were built, the length of transmission lines being 65 miles. The power so transmitted is delivered to substations and distributed in the cities of Winnipeg and St. Boniface, the towns of Transcona, Stony Mountain, and Stonewall, the rural municipalities of Fort Garry, Assiniboia, East Kildonan, St. Andrews, St. Vital, St. Pauls, Rockwood, and is supplied in bulk to the West Selkirk municipal plant. The immediate result of the introduction of hydroelectric power in Winnipeg was a reduction in the price of electric light from 20 cents per kilowatt-hour to 10 cents per kilo-

[1] Much of the material relating to power development on the Winnipeg River in Manitoba is taken from J. T. Johnston's Report on the Winnipeg River Power and Storage Investigations, 1915.

[2] Details as to the hydroelectric plant and the history and development of the various enterprises controlled by the Winnipeg Electric Railway Company will be found in the following documents: Report on Winnipeg River and Storage Investigation, pp. 138 et seq.; Appendix to Lake of the Woods Hearings, pp. 50 et seq.; Arguments re Levels of the Lake of the Woods; and the Hearings, 1912, 1915, and 1916.

watt-hour, and the base rate for power was reduced from 12½ cents per kilowatt-hour to 6 cents per kilowatt-hour. The Winnipeg Electric Railway Company had up to the end of December, 1914, expended $10,788,782 in connection with its light and power supply. The capital invested in industries owned by the same company amounted at the same date to $20,585,974.

The initial hydroelectric development of the city of Winnipeg[1] at Point du Bois Falls was commenced in 1909 and completed in October, 1911, at a cost of $1,857,000. Since date mentioned, three new 7,000 horsepower units have been added to the plant, at a cost of about $500,000. In addition, the city had expended for the construction of a tramway line in connection with its power plant, $522,000; for a telephone system, $43,000; for transmission lines and terminal station, $920,000; for real estate, $264,000; for its distribution system, $2,545,000; and for conduits, $345,000, making a total of about $7,000,000.

The third power site under development, that at Du Bonnet Falls, by the Winnipeg River Power Company, has not yet been developed beyond the clearing of the site, the building of a railway and some other preliminary work, at a cost up to September, 1916, of about $225,000. The estimated cost of the completed works is about $6,000,000. The site is about 65 miles from Winnipeg, and the proposed scheme of development will ultimately concentrate there a head of 56 feet, made up of the Grand Du Bonnet Falls, the Little Du Bonnet Falls, and the Whitemud Falls.

In a statement filed by the superintendent of the Dominion Water Power Branch at the 1916 hearings in Winnipeg, the total capital investment in industries in the Greater Winnipeg Water District, and directly dependent upon Winnipeg River power, is given as approximately $170,000,000. This invested capital represents an annual pay roll of about $24,000,000, with about 30,000 persons directly engaged therein, and a total annual product worth over $135,000,000. This is the result merely of the two existing developments—that is, the complete development of the Winnipeg Electric Railway Company in the Pinawa Channel, producing about 28,000 horsepower, and the partial development of the city of Winnipeg at Point du Bois Falls, producing at the present time about 25,000 horsepower. As already stated, the nine distinct power sites on the Winnipeg River in Manitoba are estimated to offer a total development of over 420,000 continuous 24-hour horsepower.

In addition to the water power sites on the Winnipeg River in Manitoba, there is also one at White Dog Rapids, in that portion of

[1] Details in connection with the city of Winnipeg's plant at Point du Bois Falls will be found in the Report on Winnipeg River Power and Storage Investigation, pp. 148 et seq; Arguments re Levels of the Lake of the Woods, pp. 29 et seq.; and the Hearings, 1912, 1915, and 1916.

the river which lies within the Province of Ontario. It was stated at the 1916 hearings in Winnipeg that there is a possibility of developing a head of about 45 feet at the White Dog Rapids. This water power is controlled by the Hydro Electric Power Commission of Ontario.

Although in time local markets may develop for some of these water powers on the Winnipeg River, it is altogether likely that the city of Winnipeg will continue to absorb the larger part of the available energy. At the present time, in addition to the 22,000 horsepower steam auxiliary of the Winnipeg Electric Railway Company, there is a total installation of 81,000 hydraulic horsepower on the Winnipeg River. Allowing for generating, transforming, and transmission losses, this latter quantity becomes approximately 63,000 horsepower at the switchboard in Winnipeg. The total peak load in both the city and railway systems in 1913, 1914, and 1915 was 51,200, 55,400, and 58,200 horsepower, respectively. It is evident that the present installation, without the steam plant, will in another year be taxed to its full capacity.

The city of Winnipeg in 1914 had an estimated population of 210,000 inhabitants. Assuming that the same rate of growth will hold in the future as in the past, Winnipeg in 1948 will have a population of 800,000. The present consumption of power in Winnipeg rises during peak load to 260 horsepower per 1,000 inhabitants, or an equivalent continuous use of 140 horsepower per 1,000. A population of 800,000 in 1948 would on this basis require about 200,000 horsepower for peak load distribution. This would mean a development of, say, 225,000 peak load horsepower on the river, from which 140,000 continuous horsepower at the turbines would be obtained. With the present low-water flow of 12,000 c. f. s. in the Winnipeg River, a continuous power of 250,000 hydraulic horsepower would be available if all of the sites in Manitoba were developed. With a regulated dependable flow of 20,000 c. f. s. in the Winnipeg River, a continuous power of 420,000 hydraulic horsepower would be available. At the present rate of consumption of power there would be considerable power remaining for other uses in the surrounding territory in 1948. Assuming, however, that the per capita rate of consumption will increase as rapidly as in the past few years, the requirements of Winnipeg at that time would practically absorb all the available power.

Up to the time that the present low-water flow of 12,000 c. f. s. is fully utilized by any of the existing plants, regulation of the Lake of the Woods is not necessary for power purposes. At that time, however, with no increase in the low-water flow, it would become necessary for each company to either develop another site, install a steam auxiliary, or suffer a curtailment of business. The building

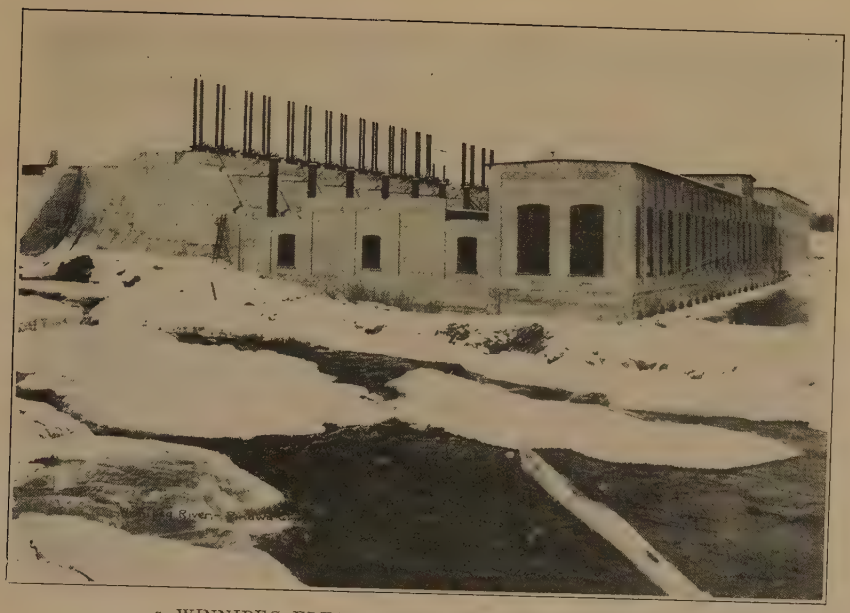
of a steam auxiliary or another hydraulic plant would entail a heavy overhead charge, and require an increase in rates to electrical consumers. On the other hand, if with the same dam and head works an additional dependable supply of water would allow of the installation of further turbines and generators, the overhead charges would be proportionately lessened, and, therefore, a decrease in power rates would result.

When the extremely low rates charged for power to domestic and commercial consumers in Winnipeg are considered, the cause of the phenomenal increase in the rate of consumption of power is self-evident. The future development of its industries, therefore, depends upon an unlimited supply of cheap power, and that can not be produced by steam plants because of the excessive cost of coal. Theoretically the minimum rate for power can be obtained at any one site under present conditions when the largest dependable flow possible is available and fully developed at that site.

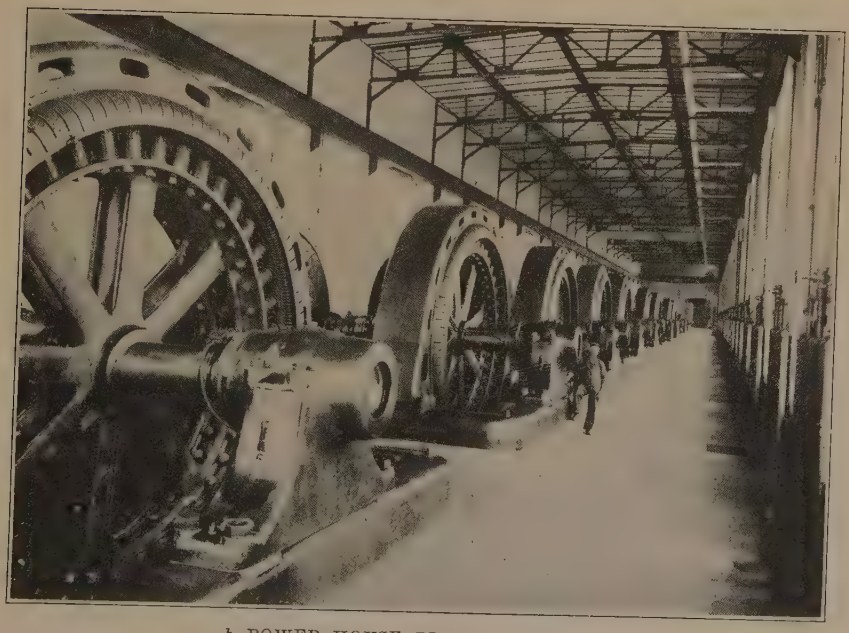
If the cheap supply of water power for Winnipeg is to be continued in the future, this must be done by proper regulation of the English River and the Lake of the Woods, regulation of the former being an internal matter for the Dominion of Canada to decide. The feasibility of the regulation of the latter for benefiting this power depends on the relation of the benefits accruing to the proprietors of these plants and the cost of obtaining such regulation on the Lake of the Woods, Rainy Lake, and the upper reservoirs.

Apart from those considerations which involve the preservation of the rights of the various interests, large or small, affected by the levels of the Lake of the Woods and the outflow from that lake, it would appear that the paramount question is the economical development of the very important water powers available on the Winnipeg River below the outlets of the lake. These water powers are not directly affected by the level of the Lake of the Woods, so long as they secure adequate range in lake level to permit of satisfactory equalization of outflow.

Under natural conditions, as elsewhere mentioned, the Lake of the Woods discharged its waters into the Winnipeg River through two main outlets, the larger known as the western outlet and the other as the eastern outlet. In addition to these two natural outlets there are three artificial channels. The position of these five outlets will be clearly seen by reference to Plate XIX of the volume of plates in the report of the consulting engineers. Reading from east to west, the first is the eastern outlet, now completely closed, and controlled by the Kenora municipal power house. The second is the western outlet, controlled by the Norman Dam. The third is the artificial channel at Keewatin, controlled by mill C. The fourth is



a, WINNIPEG ELECTRIC RAILWAY POWER PLANT.



b, POWER HOUSE, PINAWA CHANNEL.

the artificial channel at Keewatin, controlled by mill A. The fifth is the headrace of the old Keewatin Lumber and Milling Company at Keewatin. The three artificial channels have been cut through the narrow rocky ridge separating Portage Bay from that portion of the Winnipeg River known as Darlington Bay.

Taking these outlets in the order named, the eastern outlet is a narrow gap in the rocky ridge separating the Lake of the Woods from the Winnipeg River. In its natural state a waterfall existed here, known at Kahkahkeewitchewon, or Steep Rock Fall. In 1887 the Hudson's Bay Company secured title to the land along the easterly shore of the outlet. In 1892 the company leased certain lands at the outlet for the development of power, and a small power house was constructed. In 1902 the town of Kenora purchased the power plant and expropriated such lands as were required for the development of the power at the outlet. In 1906 the present power house was built and the channel was enlarged to allow an ultimate development of 5,800 horsepower, at 80 per cent efficiency for a 17-foot head. The total amount expended by the town of Kenora in acquiring and developing the power site at the eastern outlet is $593,000.

As mentioned earlier in the report, a timber dam, known as the Rollerway Dam, was built in the western outlet in the winter of 1887–88. This was practically a submerged weir, and was used as a means of regulating the waters of the Lake of the Woods. In 1891, an agreement was entered into between the Keewatin Lumber and Manufacturing Company and the Province of Ontario for the construction of a regulating dam and power development on the western outlet. Two years later the rights were transferred to the Keewatin Power Company. The dam, known as the Norman Dam, was commenced in November, 1893, and completed in 1898. In that year the Province of Ontario entered into a supplementary agreement with the Keewatin Power Company, with the object of utilizing the Norman Dam for regulating purposes in the interests of navigation, the control of the regulating works to be in the hands of the Department of Public Works of Ontario. Provision was made in the agreement for its termination on one month's notice in case the company should require the dam for power purposes. In that event, it would be the duty of the company to maintain the water at ordinary summer level in the interests of navigation. This agreement is still in force. In 1913, the Keewatin Power Company secured a release from the Province of certain conditions of expenditure under the agreement of 1891, viz, that they were to expend the sum of $250,000 in the creation of a water power on the western outlet, of which amount $150,000 were to be expended within a period of three years from the date of the agreement. The company have actually expended $127,000 on the works. Up to

the present time no power development has been undertaken in the western outlet.[1]

The first cutting through the rock ridge separating Portage Bay from Darlington Bay, at the site of the Lake of the Woods Milling Company's mill C, was made about the year 1881, power being developed for the operation of a sawmill. The property changed hands several times, and finally came into the possession of the Lake of the Woods Milling Company, 1907.

The cut through the rock ridge at the point where mill A is located was made by the Lake of the Woods Milling Company in 1887, and a power house was built at the lower end of the cut in Darlington Bay. At the Winnipeg hearings, a statement was filed by the Lake of the Woods Milling Company, giving the value of their property in connection with mill A as $1,980,000, and in connection with mill C as $1,164,000, or a total of $3,144,000. The company's average yearly pay roll is given as $250,000, and the yearly value of products manufactured, about $15,000,000. They are using at present (1916) from 3,400 to 3,700 horsepower, and are gradually increasing the capacity of mills A and C, expecting in time to utilize the full installation of 5,700 horsepower.

The power house and headrace of the Keewatin Lumber and Manufacturing Company, at the extreme westerly end of Portage Bay were built in 1879, and this was therefore the first power development in connection with the outlets of the Lake of the Woods. The power developed at this site was used for the operation of a sawmill and a planing mill. The former was destroyed by fire in 1905. Since 1906 the entire plant has been closed down.

The only present power development on Rainy River is that at the falls between the towns of International Falls, Minnesota, and Fort Frances, Ontario. These falls, about 2½ miles below the outlet of Rainy Lake, have been known at different periods as Chaudière Falls, Kettle Falls, Alberton Falls, Grand Falls, and Koochiching Falls. Before the building of the dam there was a natural drop here of about 22 feet.

As early as the year 1873 Mr. S. H. Fowler, of Fort Frances, who had already been on the ground for several years as a squatter, applied to the Government of the Dominion of Canada for the sale or lease of 100 acres of land at this point to be used as the site of a mill, and also for the lease of 100 square miles of timber limits on waters flowing into Rainy River or Rainy Lake.

[1] For further details as to the western and other outlets from the Lake of the Woods and the works constructed thereon see Report of Consulting Engineers, text, pp. 128 et seq.; Winnipeg River Power and Storage Investigation, pp. 163 et seq.; and the Hearings, 1912, 1915, and 1916.

On the 5th of March, 1873, an order in council was passed by the Dominion Government giving Fowler permission to build his mill, and promising favorable consideration of his application for land at the falls and a timber limit, so soon as the Indian title had been extinguished. Mr. Fowler went ahead and built his mill and a flume to convey water for power purposes from the river. He again applied for permission to purchase the land on which his mill had been built, and for a timber license.

In October, 1873, another order in council was passed sanctioning the lease of 73½ acres, and a timber license for 60 square miles. This sanction was made subject to any right of the Indians to a reserve at the falls; also to the right to take any portion of the land for public purposes; and further to any rights of the Hudson's Bay Company under its deed of surrender. The area of the timber limits was extended the following month to 100 square miles. Owing, however, to the conflicting claims of the Dominion and Ontario to the territory in which the lands proposed to be leased lay, it was not until 1881 that the Dominion Government granted Mr. Fowler a lease to two parcels of land, one north and the other south of the canal, with the privilege of erecting a dam at the head of the canal, and a bridge across the lock. This apparently was never done. The lease was canceled by order in council in 1893, and the mill was subsequently destroyed by fire. Fowler's mill represented the first use of the water of Rainy River for power purposes.

Between the last-mentioned date and 1900, a number of applications were made to the Dominion Government for authority to use the water power at Fort Frances, or portions of it, but only two contemplated a development at all commensurate with the capacity of the falls. One of these applications was on behalf of the town of Fort Frances, which submitted a scheme for the development of power and the setting apart of mill sites. The plan contemplated the construction of a flume from a point above the falls to a point below them, and running along Front Street, in the town of Fort Frances, the mill sites to be laid out on the south side of the flume.

The other application was made by a group of American capitalists, who had already acquired lands on the south side of the river and obtained the authority of the United States Government for damming the river at the falls. As their plans, however, contemplated a large power development, necessitating a dam clear across the stream, it was necessary that they should obtain the authority of the Canadian Government. There the matter rested for several years. Nothing further was heard of the scheme advanced by the town of Fort Frances; and the American interests were apparently not prepared to go on with their project until there was some assur-

ance of transportation facilities for the products of the industries they proposed to establish.

In the year 1904, however, they entered into an agreement with the government of Ontario by which they acquired the water rights on the Canadian side. This agreement was subsequently replaced by one made the following year. Both agreements provided for the construction of a dam from shore to shore of this international stream and for the development of power on the Canadian side. The same year the applicants, now incorporated as the Ontario and Minnesota Power Company, obtained an act from the Dominion Parliament confirming its right to develop power at Fort Frances. In 1906 the company obtained an act from the Legislature of Ontario. In 1910 another agreement was entered into between the Province of Ontario and the Ontario and Minnesota Power Company permitting the temporary diversion of the power generated on the Canadian side for use on the American side of the river. This agreement was confirmed by an act of the Legislature of Ontario of 1911. In 1912 an act of the Ontario Legislature was passed empowering the Ontario and Minnesota Power Company to expropriate land for a paper mill in connection with its power works at Fort Frances.

The parties on the United States side, who had acquired the lands on that side of the river, were incorporated first as the Koochiching Company, and later as the Rainy River Improvement Company. By act of Congress in 1898 they obtained authority to build a dam and develop water power on the United States side. The time allowed for the construction of the dam was extended from time to time by subsequent acts of Congress, the last being in 1908. It may be noted that, on account of the fact that the dam at this place extends from shore to shore of an international stream, it was deemed desirable that legislation should be obtained from both the United States Congress and the Canadian Parliament. In addition to the two companies mentioned, the Ontario and Minnesota Power Company and the Rainy River Improvement Company, there is also the Minnesota and Ontario Power Company, which is in the nature of a holding company for the other two. There is also on the Canadian side the Fort Frances Pulp and Paper Company.

It appears from a statement at the Winnipeg hearings in 1916[1] that the average total power developed during the five or six years that the dam has been in operation is approximately 20,000 continuous horsepower. The dam furnishes a head varying from 24 to 34 feet. The power is used for the operation of pulp and paper mills. These industries furnish employment for about 4,000 men. The total amount invested in the dam, power houses, mills, etc., on both sides of the river is approximately $10,500,000.

[1] Lake of the Woods hearings, 1916, pp. 389 et seq.

a, SEVEN SISTERS FALLS, WINNIPEG RIVER.

b, SILVER FALLS WINNIPEG RIVER.

In addition to the above-mentioned water power, there is also an undeveloped water power at the Long Sault Rapids, in Rainy River, about 40 miles below International Falls. The consulting engineers, in the text of their report (p. 226), state that a 10 to 12 foot power development at the Long Sault would appear reasonably feasible. Such a development would produce an average of about 9,000 horsepower. As already mentioned in connection with the subject of transportation, it was proposed some years ago to build a dam and lock at the Long Sault, primarily for the improvement of navigation.

At the Kettle Falls, where the waters of Lake Namakan are discharged into Rainy Lake, the Rainy River Improvement Company, completed, in 1914, two concrete and masonry dams,[2] with the object of securing additional storage on Lake Namakan. One of these, like that at International Falls and Fort Frances, crosses the international boundary. The other blocks the Canadian channel.

Above Rainy Lake, along the international boundary and in both countries, are a number of power sites at which smaller quantities of power may be utilized as the future demand for electric energy increases. Of the smaller power sites in Canada, very little information is at present available, yet it is not looking too far into the future to see these powers used for local purposes, for mining perhaps, or for electrification of portions of the three transcontinental railways which pass through or near the Lake of the Woods watershed.

On the United States side of the upper watershed area, a market is already in existence for all the available water powers. Although the cities of Duluth, Superior, and Two Harbors, with a combined population of 150,000, are within a direct distance of 100 miles from these powers, one need look no further than the great iron ranges which lie partly within or directly contiguous to the watershed south of Vermilion Lake. These undeveloped powers lie within a radius of from 35 to 65 miles from the center of the Mesabi Range. Along the international boundary, at three sites between Basswood and Namakan Lakes, an average of approximately 20,000 horsepower may be developed, while at four sites on the Vermilion River and one on the Kawishiwi River a total average of about 8,000 horsepower may be obtained. In fact, the Kawishiwi River Power Company has already been organized to build a plant at this latter site. Certain of these power sites must, of course, await further settlement and development before dams, plants, and transmission lines can be economically constructed, yet eventually this power will be mainly consumed in mining operations on the range, and for domestic and municipal use.

[2] These dams, as well as the International Falls-Fort Frances Dam, the water power developed there, and the paper and pulp mills in both towns are controlled by the same interests.

Some idea of the future importance this power will be to one of the greatest industries of America, may be obtained when we consider the rapidly increasing use of electricity for commercial and mining purposes, and the full extent to which the available power southward from the range will soon be utilized by the growing cities of Duluth, Superior, and Two Harbors.

In time, should the supply of pulp wood become exhausted, a portion of the International Falls power might be transmitted to the iron range, a distance of about 90 miles, or if necessary even to the Duluth district, a distance of about 150 miles. At such time, say in 50 years, the entire arable portion of the watershed would doubtless be settled, and a considerable market for local power would be available, such as the Northern States Power Company has built up in southern Minnesota.

XIII.—DIVERSIONS FROM THE WATERSHED.

In the Report a brief summary is given of certain correspondence between the Government of the United States and the Government of Canada in relation to the proposed diversion of the waters of Birch Lake to Lake Superior. As this project and the questions to which it gave rise became one of the factors in the decision of the two Governments to refer to the commission for investigation and report the matter of the levels of the Lake of the Woods, and as the commission in its report has made certain recommendations on the subject of diversions from the Lake of the Woods watershed, it seems convenient to give a brief account of the project for the diversion of waters of Birch Lake.[1]

The Minnesota Canal and Power Company, a corporation organized under the laws of Minnesota, sought authority to divert at least 600 c. f. s. from the Birch Lake drainage basin, in St. Louis and Lake Counties, Minnesota, and forming part of the Lake of the Woods watershed, into the Embarrass River, thence into the St. Louis River, and St. Louis Bay of Lake Superior. The object of the diversion was to furnish hydroelectric power to the city of Duluth.

The company proposed to erect a dam at the mouth of Gabbro Lake to impound water in the lakes tributary thereto and form what was called the Isabelle Reservoir; to erect a dam in the North Kawishiwi River, to impound the waters in the lakes and streams tributary to Birch Lake naturally flowing westerly into White Iron and Garden Lakes; to erect a dam in the South Kawishiwi, which, in connection with the dam last mentioned, would form the Kawishiwi Reservoir; and to erect a dam in Birch River at the outlet of Birch Lake to impound its waters and form the Birch Lake Reservoir.

The company proposed to cut a canal from the west end of Birch Lake, a distance of about 6 miles across the divide, to the headwaters of the Embarrass River, and to erect controlling works at the entrance of this canal to regulate the flow of water from Birch Lake into the Embarrass River Canal. From a point in the St. Louis River above Cloquet it proposed to dig another canal about 24½ miles long to a point in the city of Duluth, where the bluff is about 600 feet above the water level of Lake Superior, and to lay pipes from the easterly end of this, the St. Louis River Canal, to the power house

[1] Some of the documents quoted in the Report will be found in the present chapter. This repetition is necessary to complete the history of the proposed diversion.

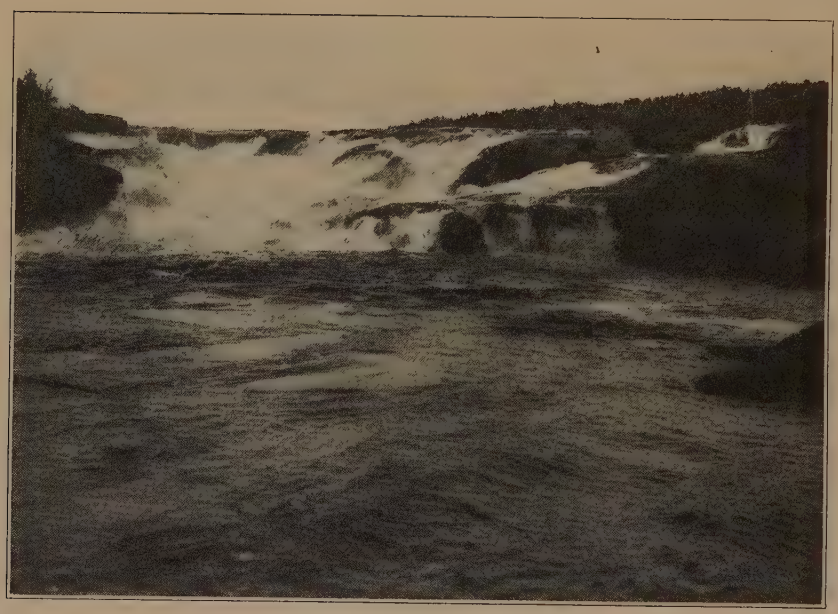
of the company to be erected on the shores of St. Louis Bay. The company expected to develop about 30,000 electrical horsepower, the amount of water diverted and of power created to be increased hereafter if circumstances permitted.

The Birch Lake drainage basin contains a chain of small lakes, the largest of these, known as Birch Lake, lying near the western border of the basin. A portion of the drainage of this basin flows westerly through the North Kawishiwi River and Farm Lake to Garden Lake, with a fall of about 56 feet in the distance of 9 miles; another portion flows southwesterly through the South Kawishiwi River into Birch Lake, and thence northerly through Birch River and White Iron Lake to Garden Lake, the distance traversed by the waters along this route being about 24 miles. Passing Kawishiwi Falls, the waters continually increasing in volume, flow through Fall Lake over the Pipestone Falls to Basswood Lake, lying on the international boundary between the United States and Canada; the waters thence flow in a general northwesterly direction through Crooked and Iron Lakes, Lac la Croix, Namakan River and Lake, to Rainy Lake, and thence through Rainy Lake to the Lake of the Woods, down the Winnipeg River to Lake Winnipeg, and finally by Nelson River to Hudson Bay. From Basswood Lake to the Lake of the Woods the waters flow along the international boundary line, with the exception of about 20 miles, where they traverse the Namakan River entirely in Canadian territory.

On February 25, 1904, the Minnesota Canal and Power Company applied to the Secretary of the Interior at Washington for authority to use certain public lands, by flowage and otherwise, for the purpose of creating electrical power at Duluth. Application was also made to the United States Secretary of War for the approval of certain plans for structures designed to impound the waters of the Birch Lake drainage basin and divert them to Lake Superior, and for authorization to erect such structures and divert the water.

Under the terms of its charter from the State of Minnesota, the company had power to erect the works for the construction of which it had asked the authorization of the War Department. It was also vested with certain powers of eminent domain. It brought proceedings in the district courts of Minnesota with the object of putting into exercise the right of eminent domain, and of condemning property and rights affected by the carrying out of its plans. The result of these actions and of subsequent appeals to the Supreme Court of Minnesota will be referred to later.

Among numerous protests from both Canadian and United States sources against the proposed diversion, one from the town of Fort Frances, Ontario, dated March 17, 1904, was communicated by the Canadian Government through the British Embassy to the Govern-



ONE OF MANY WATER POWERS.

ment of the United States. On January 25, 1905, the State Department at Washington informed the British ambassador that the Secretary of the Interior had directed the Commissioner of the General Land Office, before whom the application of the Minnesota Canal and Power Company was then pending, to suspend further action in the case until advised as to the result of an investigation to be made by the International Waterways Commission.

Earlier in the same month the Secretary of State for Canada had drawn the attention of the Canadian section of the International Waterways Commission to "the proposed diversion southward by the Minnesota Canal and Power Company, of Duluth, of certain waters in the State of Minnesota that now flow north into the Rainy River and the Lake of the Woods." In March, 1905, the matter was brought to the attention of the American section of the commission by a letter from the company asking that the commission deal with the question at the earliest practicable moment.

The question came up before the International Waterways Commission in June, 1905, but no action was taken, because there existed some doubt as to the jurisdiction of the commission.

In August of the same year the subcommittee of the commission made a general investigation of the boundary waters and, among other matters, reported upon the project of the Minnesota Canal and Power Company. The committee stated in their report that the water of the Birch Lake drainage system formed by computation 7 per cent of the water passing out of Rainy Lake at Alberton or Koochiching Falls; that the water system of Rainy Lake and Lake of the Woods had long been established as a commercial highway; and that—

> It is claimed that if permission be given by the Federal Government of the United States to the project of the Minnesota Canal and Power Company, a disastrous injustice will be done to Canadian and American established navigation companies that are now using the water highway of Rainy Lake and Rainy River and to the manufacturing towns along the river, both on the Canadian and United States sides.

In the first progress report of the Canadian section of the International Waterways Commission, dated December 24, 1905, the report of the subcommittee was indorsed. The report says:

> It is claimed that the waters of Birch Lake and Birch River and White Iron Lake help to form the chain of lakes and rivers along the boundary which are referred to in the Webster-Ashburton treaty, and which, by the terms of the treaty, are a public highway, free to the citizens and subjects of both countries.

The reference here is to Article II of the treaty of 1842, the essential portion of which reads as follows:

> It being understood that all the water communications and all the usual portages along the line from Lake Superior to the Lake of the Woods, and

also Grand Portage, from the shore of Lake Superior to the Pigeon River, as now actually used, shall be free and open to the use of the citizens and subjects of both countries.

At the time the treaty was negotiated these waters through which the international boundary line passes still constituted the canoe route of the fur traders from Grand Portage to Rainy Lake.

In 1906 the application of the Minnesota Canal and Power Company was formally referred to the International Waterways Commission by the Secretary of War of the United States for investigation and report.

In November of the same year the commission made a joint report on the company's application. The commission, after outlining the history of the case and describing the source and nature of the objections and protests filed with the commission on behalf of various interests opposed to the granting of the company's application, drew attention to the fact that the action of the British ambassador on behalf of the Canadian Government January 3, 1905, in requesting that the proposed diversion be not carried out pending the meeting of the commission—

together with the fact that the rights and interests of Canadian citizens will be affected by the carrying out of the plans of the Minnesota Canal and Power Company, and the fact that navigation of boundary waters will be to some extent injured, if such plans are put in operation, present international questions which, in the opinion of this commission, will be involved in many other instances of boundary streams between the two countries and require the most careful consideration.

In discussing at length the international aspect of the question involved in the application of the Minnesota Canal and Power Company the commission asserted that "the proposed diversion, so far as it would affect navigation on the boundary waters, presents a serious objection to the granting of the privilege asked." After quoting the language of the treaty of 1842, providing for "the free and open use of the boundary waters from Lake Superior to the Lake of the Woods by the citizens and subjects of both countries," the report says:

This clause secures to Canada free and unobstructed navigation of the boundary waters from which the proposed diversion is to be made. In the opinion of the commission it secures to Canada, by necessary construction, the right to navigate those waters in any manner which the natural flow will permit. Any interference with the natural flow which decreases the navigable capacity of Basswood Lake, Rainy River, Rainy Lake, or the Lake of the Woods is a violation of the letter and spirit of the treaty, and the extent of the interference is not important; if the navigable capacity is injuriously affected, Canada has the right to object. Nor does the possibility of restoring and regulating the flow in the boundary waters mentioned, by remedial works, confer any right to lessen the navigable capacity, for such works will have to be constructed in part in the Dominion of Canada, and this can not be done without Canada's consent, nor can the burden of constructing such works be imposed upon her.

The report notes the different construction placed upon the phrase "as now actually used," as securing the right of canoe navigation and nothing more, on the ground that at the time the treaty was entered into the waters in question were used only for canoe navigation, but very properly points out that the words quoted relate not to the water communications but to the Grand Portage, and continues:

It was evidently the intention of the treaty-making powers, in defining the boundaries, to secure to both countries the free and open use of the boundary waters for interior communication and transportation; and it would seem to be a narrow construction of the clause in question which would assign to those powers the intent to limit the right of communication and transportation to canoes, for this would place them in the position of utterly ignoring future conditions and practically destroying the value of the waterways as means of communication. The broader and proper construction, in the opinion of the commission, is that the intent was to preserve to both countries the "free and open use" of the boundary waters, in any manner that they could be made use of for the purposes mentioned.

In the opinion of the commission, therefore, the permit to permanently divert waters which would supply the boundary lakes and streams ought not to be granted without the concurrence of the Dominion of Canada.

The report further states that, apart from the effect of the treaty of 1842, the proposed diversion would to some extent affect injuriously riparian rights upon the Canadian side of the boundary waters, and would also affect the water supply of the Namakan River and other waters wholly in Canada.

The commissioners pointed out that, in arriving at their conclusion that the permit to permanently divert the waters of the Birch Lake drainage basin ought not to be granted without the concurrence of Canada, the principles involved do not impugn the right of the United States to grant the permit, but at the same time they are of such great importance and of such widespread application that the commissioners believe that they should be settled and applied by both countries.

The commission discussed at length the principles of international law involved in the diversion of waters on one side of an international boundary which may affect interests on the other side of the boundary, quoting Phillimore, Farnham, and other authorities, to the general effect that while the jurisdiction of a nation within its own territory can not be limited except by itself, the exercise of that right to the injury of a friendly nation is not justifiable.

The report set forth the following conclusions of the commission:

1. While the work proposed by the applicant will be of great advantage to the interests served, it will interfere with public and private interests in Canada, and the commission sees no public necessity for it.

2. The proposed diversion will injure the interests of various classes of persons, namely, residents of the United States having property rights in the

State of Minnesota, residents of the United States having property rights and interests in Canada and in the boundary waters, residents of Canada having property rights and interests in Canada, and municipalities of the Dominion of Canada. The rights and interests which will be affected are divisible into two classes, namely, those which depend upon navigation directly or indirectly, and those which depend upon the use of waters of the various streams and lakes for power purposes.

3. The proposed diversion will affect injuriously navigation upon the boundary waters between the United States and Canada, above mentioned, and upon navigable waters in Canada connecting said boundary waters; but

4. So far as water-power interests on the international boundary or in Canada are concerned, which depend upon the supply from the Birch Lake drainage area, although remedial works at locations above Rainy Lake may be constructed, the total amount of water which can be stored and used for power purposes upon the boundary and connecting waters located wholly in Canada will be diminished.

5. The applicant, the Minnesota Canal and Power Company, of Duluth, Minn., under the decision of the Supreme Court of Minnesota, above cited, apparently has not the power to utilize the permit it seeks to obtain, but possibly may acquire that power. It would seem, therefore, that the permit which the applicant seeks ought not in any case to be granted before it secures authority under the laws of Minnesota to utilize it.

6. That the rights and interests of the residents of Minnesota which may be affected by the proposed diversion, are of so much less importance than the interests which will be promoted by the proposed works of the applicant, that they do not furnish a sufficient reason for refusing the permit sought, inasmuch as full compensation must be made to such persons under the laws of Minnesota.

7. Neither the State of Minnesota nor the United States can provide the adequate means by which money compensation can be ascertained and made to the owners of the interests in Canada which may be injured, and it follows that individuals sustaining injury would be relegated to litigation. This is a violation of the principle of law that private property shall not be taken for public use, unless provision for compensation can be made without litigation and its attendant delays and expense.

8. So far as remedial works are concerned, it is sufficient to say that there is no jurisdiction in the United States or in the State of Minnesota to provide for or permit the erection of the necessary remedial works in Canada.

9. That although it might be advisable to grant the permit applied for, in case the applicant should require the powers necessary to utilize it, if objections arising from international relations did not exist, treaty provisions, international comity, and the impossibility of providing just means of assuring adequate compensation for injury to interests in Canada, or of preserving navigation unimpaired on the boundary streams, without concurrent action of both Governments concerned, lead us to the conclusion that the permit should not be granted unless the full protection of all interests not cared for by the laws of Minnesota be secured by concurrent action of the United States and Canada.

The commission concludes its report with a recommendation that "the permit applied for be not granted without the concurrence of the Canadian Government." At the same time it suggested the negotiation of a treaty for the settlement of rules and principles from

which all such questions might be peacefully and satisfactorily determined as they arose. It further suggested that such a treaty "should prohibit the permanent diversion of navigable streams which cross the international boundary or which form a part thereof, except upon adjustment of the rights of all parties concerned by a permanent commission, and with its consent."

In this same report of the International Waterways Commission, a number of objections and protests from interested parties on both sides of the boundary are set forth in detail, and the arguments for and against the application of the Minnesota Canal and Power Company are carefully analyzed.

The application of the company to the United States Secretary of War was dealt with in a report by Major George McC. Derby, dated May 24, 1905, and addressed to the Chief of Engineers, United States Army. Major Derby enumerated the conditions under which he considered the application should be granted, which included the following:

The Minnesota Canal and Power Company should construct and maintain a dam or dams in Lake Namakan, or at some point or points above Rainy Lake, so as to impound and store during periods of high water, when it would otherwise go to waste, an amount of water equal to the entire amount diverted from the watershed of Rainy Lake, releasing this water into Rainy Lake from time to time as the interests of navigation in Rainy River and above may require, in accordance with regulations to be made by the Secretary of War.

The Minnesota Canal and Power Company should construct and maintain such additional dams as may be necessary to maintain Basswood Lake and the other lakes between Birch Lake and Rainy Lake at or above their mean level; and should release from all such dams from time to time such amount of water as may be necessary to sluice logs from one lake to the next, and for other interests of navigation, in accordance with regulations to be made by the Secretary of War.

Apparently no action was taken on Major Derby's report until May 19, 1910, when the Secretary of War issued a permit for the diversion of 600 c. f. s. by the Minnesota Canal and Power Company from the Birch Lake drainage basin, into the St. Louis River, and thence into its water-power canal. The permit was issued upon certain conditions apparently designed to safeguard navigation and other interests that might be affected by the proposed diversion. So far as international waters are concerned, clauses 2, 3 and 4 are of special interest.

2. That such supplemental dams, reservoirs, and other controlling works, as the Secretary of War may deem necessary to prevent interference with the navigable capacity and use of the waters of the Birch Lake drainage basin, and the various lakes and streams to which they are tributary, shall be constructed by said Minnesota Canal and Power Company.

3. That said company hereby accepts and agrees to comply with any special conditions which the Secretary of War may hereafter deem necessary and impose for the protection of property and other private interests on both sides of the international border.

4. That the diversion of water power under the authorization shall be of such amount only as will not materially interfere with the navigable capacity of the waterways affected.

Protests were send to the United States Secretary of War and to the Canadian Government against the issue of the permit by the Lake of the Woods Milling Company, the city of Winnipeg, the Winnipeg Electric Railway Company, and other interests opposed to the proposed diversion.

Mr. Louis Coste, of the International Waterways Commission, reported upon the matter in a letter dated February 26, 1910, in which he said:

I understand that the permit granted by the Secretary of War for the United States, for the diversion in question, contains provisions against any damage to navigation interests; but I fail to see how a permanent diversion of 600 cubic feet of water per second from a river like the Rainy River, whose minimum flow is certainly not more than 4,000 cubic feet per second, can be permitted without injuring navigation interests on that river at the period of low water.

In connection with this important question, which may affect materially navigation interests on the Rainy River and on the Winnipeg River, and certainly affects detrimentally the interests of power companies on these rivers, permit me to suggest that the Canadian section of the present International Waterways Commission be requested to report on the merits of the question by a reference made directly either from your department or by the privy council.

Mr. Coste recommended that the attention of the United States Secretary of War be called to the fact that the Canadian Government had received protests against the permit for the diversion, and that it was important that the matter be investigated from an international standpoint.

In a further letter dated October 1, 1910, Mr. Coste said:

In my opinion these provisions (in the permit) are totally inadequate and would have to be supplemented by the construction of various dams creating large reservoirs upon Canadian territory. It is apparent therefore that the Canadian Government can legitimately protest against this permit in spite of Article II of the recent treaty concluded between the two countries.

On October 25, 1910, the International Waterways Commission was requested by the Secretary of State for Canada to examine into and report upon the subject of the proposed diversion.

Three days later the commission reported. After quoting the terms of Article II of the treaty and the terms of the permit granted by the Secretary of War, the commission suggested the need of further conditions being imposed under the permit to fully protect the private interests in Canada which would be injuriously affected by the proposed diversion. It was submitted that "one of the conditions necessary may be a provision requiring that the company shall amend their State charter in such a way as to protect

a, MAIN WEIR, PINAWA CHANNEL.

b, WINNIPEG POWER PLANT, POINT DU BOIS FALLS.

Canadian interests by providing for such interests the legal remedies provided by Article II of the treaty;" and they added:

It is exceedingly desirable with a view to the proper fulfillment of the obligations entered into by each country, that uniform conditions and regulations should be agreed upon which would be applicable in all cases arising under this provision.

Referring to the last paragraph of Article II of the treaty, and the following language of the permit granted by the Secretary of War, "the diversion of water power under the authorization shall be of such amount only as will not materially interfere with the navigable capacity of the waterways affected," the commission reported as follows:

It is submitted with respect, however, that it would be very unsafe to allow the proposed diversion to proceed with only this general provision for the protection of public interests of navigation which may be affected in Canada. As similar difficulties are likely to arise elsewhere, it is respectfully submitted that where diversions in one country may be productive of injury to navigation interests in the other, permission should not be granted authorizing such diversions or obstructions until some international tribunal such as the new international commission should have considered and reported upon the effect of such diversions or obstructions upon such interests, and with regard to the compensatory works necessary to be constructed in each case.

In reply to a letter from the Under Secretary of State for External Affairs (Canada), Mr. (now Sir) George C. Gibbons wrote on October 29, 1910:

It must be taken that the plans to be approved will provide for the construction and maintenance of such remedial works as will fully compensate for the injury which otherwise would be done * * *. At the same time I think the ground taken in our report that some international tribunal should be consulted as to what remedial works are necessary is unquestionable. It may be, and I think will be, essential that some of these works should be constructed in Canadian territory. This makes it still more important that a thorough joint understanding be arrived at before any plans are approved.

On November 22, 1910, the Secretary of State for External Affairs reported to the Privy Council on the question of the Birch Lake diversion; and on December 22, 1910, a report of the Committee of the Privy Council was approved by His Excellency. The report sets forth the fact that the city of Winnipeg and other interests had protested against the proposed diversion; that the International Waterways Commission had reported against the granting of a permit without the concurrence of the Canadian Government; that Article II of the treaty is designed to safeguard interests on one side of the boundary injuriously affected by such diversion on the other side of the boundary; that paragraph 3 of the permit granted by the Secretary of War is doubtless intended to provide such special conditions as will protect private interests on both sides of the boundary line;

that citizens of Minnesota are possibly protected by State legislation, but that "special conditions may have to be imposed on the company for the protection of property and other private interests on the Canadian side of the international border, so as to provide to citizens of Canada the same legal remedies as if the injury done them took place in the State of Minnesota"; that the Government desired information as to "what rights and remedies the citizens of Minnesota will have with regard to the proposed diversion, and what corresponding measures are intended to be taken with a view to the establishment of similar rights, and to provide similar legal remedies for citizens of Canada."

In regard to the apprehended injury to navigation, the report requested:

> That the United States Government should be asked to consider whether in cases where the diversion or obstruction of water in one country may be productive of injury to navigation interests in the other, permission for such diversion or obstruction should be granted until the International Joint Commission provided for in the boundary waters treaty has considered and reported upon the effect of such diversions or obstructions upon such interests, and with regard to the compensatory works necessary to be constructed in each case.

On December 29, 1910, His Excellency the Governor General forwarded a copy of the report mentioned above to the British Embassy at Washington, with a request that the matter be brought to the attention of the United States Government with the object of obtaining an expression of their views on the subject.

On August 22, 1911, the Acting Secretary of State at Washington replied to the British ambassador, stating that—

> The provisions of Article II (of the treaty) are regarded by this Government as self-operative as laws and do not require any supplemental legislation to give them effect on this side of the boundary, so that by virtue of this article of the treaty the Canadian interests concerned are already entitled to all the legal rights and remedies which would be extended to them in the local courts if their cause of action arose within the jurisdiction of those courts.
>
> I regret that this Government can not undertake to answer your inquiry as to what are the rights and remedies of the citizens of Minnesota in respect to such a case as the one under consideration, for that is a question which depends to a great extent upon State law rather than Federal law, and falls outside of the jurisdiction of this department, except in so far as the treaty requires that Canadian interests shall receive the same treatment as similar interests in the State of Minnesota, and on this point the provisions of the treaty are regarded as sufficient in themselves to insure such treatment.
>
> This Government has also given careful consideration, as requested by you on behalf of the Canadian Government, to the question of whether in cases where the diversion or obstruction of water in one country may be productive of injury to navigation interests in the other, permission for such diversions or obstructions should be granted until the International Joint Commission provided for under the treaty has considered and reported upon the effect of such diversions or obstructions upon such interests and with regard to the compensatory works necessary to be constructed in each case.

It appears from an examination of the terms of the treaty that no jurisdiction is conferred upon the International Joint Commission with reference to waters flowing across the boundary or which are tributary to boundary waters in distinction from boundary waters themselves as defined in the treaty and that therefore the commission has no authority to refuse permission to divert or obstruct waters of the description referred to in this inquiry. That the Canadian Government concurs in this view is evident from the fact that instead of proposing that the desired action be taken under the treaty the proposal comes in the form of a request for the cooperation of this Government. In the absence of an express treaty provision conferring upon the commission jurisdiction to deal authoritatively with a case involving the diversion of tributary waters, it does not seem desirable to this Government that such a question should be referred to the commission, because the rights of the interested parties in such cases are conclusively established under the provisions of Article II of the treaty, and an attempt by the commission to interfere in such rights would necessarily be ineffective. Under Article IX of the treaty, however, jurisdiction is conferred upon the commission to examine and report at the request of either party upon all questions not otherwise dealt with in the treaty which involve the rights, obligations, or interests of either party in relation to the other or to the inhabitants of the other along their common frontier, and it would be agreeable to this Government to take up with the Canadian Government the question of requesting the commission to examine into and report upon a general plan for the improvement for navigation and power purposes of all the boundary waters to which the waters referred to in your note are tributary.

On December 21, 1911, the Secretary of the Interior Department of Canada wrote the International Joint Commission calling their attention to the fact that that department had jurisdiction over the water powers of the Province of Manitoba, and desired to bring before the commission the great water-power interests, both present and future, which are dependent on the Winnipeg River, and which would be affected by the diversion of the waters of Birch Lake drainage basin by the Minnesota Canal and Power Company. The letter is accompanied by several maps and describes in detail the drainage areas, power possibilities, and present and prospective developments of power on the Winnipeg River, "sufficient to show the enormous future importance of this river to the Province of Manitoba, and to show the importance of guarding it against any possible depletion in its headwaters."

The letter concluded:

It would appear inadvisable to in any way interfere with the natural source of supply and allow a permanent diversion of any portion of it from its natural channels. Before any final authorization of the proposed Birch Lake diversion is made, it is desired that the water-power resources of the Winnipeg River in the Province of Manitoba be fully considered, and if any conference is held regarding the proposal, that the Department of the Interior be given an opportunity to appear and present its views.

The Minnesota Canal and Power Company, as already mentioned, brought proceedings in the courts of Minnesota for the purpose of ex-

ercising the right of eminent domain. The case was appealed in 1906 from the district court to the Supreme Court of Minnesota, which decided that the waters which would be affected by the carrying out of the company's plans were public navigable waters, and that the statutes under which the company was organized did not, as an incident to the construction of the canal and the creating of the water power, authorize it to withdraw and divert waters from public navigable lakes and streams to such an extent as to interfere with present or future navigation, and by means of canals carry it over a divide and discharge it into a different drainage area, thus permanently withdrawing it from its natural course. The application of the company to condemn property and rights of individuals was therefore dismissed.

The supreme court in dealing with the case said:

> In view of the presumption in favor of the rights of the individual; the State and Federal prohibition against the obstruction of navigable waters; the rule that the rights of the State in such waters are sovereign and not proprietary, that they are held by the public as highways and can not be alienable; the possible effect upon the rights of riparian proprietors in the Province of Ontario; the fact that the doctrine of the appropriation of waters, adopted in some of the Western States, does not prevail in Minnesota, and is not recognized by the conventional law of nations; the treaty relations between the United States and Great Britain with reference to the boundary waters between the United States and Canada; and that the taking of the waters would interfere with streams and lakes which are already devoted to public uses, which can only be done under express statutory authority.

The court held that the applicant was not authorized to condemn the interests sought to be condemned.

The company, assuming that the adverse decision of the supreme court was based upon the ground that its petition included private as well as public uses, filed another petition making the purposes for which condemnation was sought wholly public, and began new condemnation proceedings. This case came before the Supreme Court of Minnesota in 1907, and again the court denied the company's petition.

In 1913 a third attempt was made on behalf of the Minnesota Canal and Power Company to secure legal authorization of its project. Judgment was given against the petitioner in the district court, and the judgment was confirmed the following year by the Supreme Court of Minnesota. In the opinion attached to his judgment Judge Cant of the district court said:

> Under the Webster-Ashburton treaty of 1842, the water communications along the boundary line from Lake Superior to the Lake of the Woods are specifically mentioned and specific rights in reference thereto are guaranteed. So long as that treaty remains in force "any diversion of these waters by means of dams and reservoirs constructed within American territory which would deprive

citizens of both countries of the common use of the boundary waters would violate this provision of the treaty."[1] So long as that treaty remains in force, it is binding upon courts, legislatures, executive officers, and private citizens. It may be abrogated by mutual consent or by inconsistent action constituting a breach thereof on the part of either of the Governments affected thereby. The intent to terminate a treaty by willful violation of its terms on the part of either Government will not be presumed. Such a conclusion will not be hastily reached if any other reasonable view consistent with national good faith may be taken.

It had been urged on behalf of the company that the Webster-Ashburton treaty had been modified or superseded in two ways: by congressional action and by the treaty of January 11, 1909, commonly known as the waterways treaty. As to the act of Congress mainly relied on, the act of March 3, 1899, requiring the consent of the Secretary of War, on the approval of the Chief of Engineers, to the construction of public works in any navigable waterway within the United States, the Supreme Court of Minnesota had held in the Pratt case that this act of Congress was in no way inconsistent with the treaty. Judge Cant's conclusion is that the Webster-Ashburton treaty "has not been modified by any congressional action."

As to the treaty of January 11, 1909, Judge Cant's opinion is that its effect is "to leave the waters here involved subject to the provisions of the earlier treaty of 1842." He says:

> The treaty of January 11, 1909, applies to a great number of lakes and rivers all along the boundary line from the Rivers St. Croix and St. John on the east to the waters of Puget Sound on the west. The rivers cross and recross the boundary line in many places. There were disputes with reference to many of these waterways, and doubtless with reference to many streams which were not waterways, as well those crossing the boundary as those forming a part thereof. It was necessary that a better understanding be had. Some of the waters were already the subject of specific treaty provisions. Others doubtless were not. Those covered by treaty were in a special and limited class by themselves. As already indicated, those here in question were subject to the specific provisions of the treaty of 1842. Article II of the treaty of 1909 provides for reserving to the respective Governments "the exclusive jurisdiction and control over the use and diversion, whether temporary or permanent, of all waters on its own side of the line which in their natural channels would flow across the boundary or into boundary waters," but "subject to any treaty provisions now existing with reference thereto." So far as the treaty of 1909 is concerned, the effect of the provision last quoted must be to leave the waters here involved subject to the provisions of the earlier treaty of 1842. Article III of the treaty of 1909 confirms this view. The treaty of 1842 is therefore unaffected either by congressional action or by any subsequent treaty.

Discussing the validity of the permit granted by the Secretary of War, May 19, 1910, for the proposed diversion from Birch Lake, Judge Cant points out that it was not the intention of Congress either to violate the Webster-Ashburton treaty or to authorize any

[1] Pratt case, 101 Minn. R., p. 231.

such violation on the part of the Secretary of War. He takes the view that while supervisory authority is properly vested in the Chief of Engineers and the Secretary of War with respect to certain improvements in connection with waterways all over the country, that authority may be much restricted in the case of waterways subject to treaty provisions. In such cases they might properly deal with the height of a bridge or the length of a pier, or even with trifling incidental diversions of water, but—

> where at the outset we are face to face with the doing of that which a treaty plainly forbids, such as the diversion of water on a large scale, it is necessary to halt. Leaving out of mind the qualifying effect of the treaties upon the congressional acts in question, the diversion of water in any substantial quantities from one watershed to another is an important and far-reaching undertaking. The authority therefore should be clear. It is reasonably certain that the congressional acts in question contemplated nothing of this kind.

Judge Cant also discusses the question as to whether or not the proposed diversion from Birch Lake of a quantity of water necessary to the successful prosecution of the petitioner's enterprise would substantially interfere with the navigability or with the navigable capacity of the waterways in question. He emphasized the fact that the present public uses to which the waters in question are put do not constitute the real test of the situation.

> What future use or future necessities should reasonably be anticipated? The adjacent territory will develop along many lines, some of which we can foresee and many of which doubtless we can not. Is it not likely that much or all of the water which can be reservoired will in the not distant future be required for the navigation of the waterways along which such waters would naturally flow? Judging from the evidence it is not unlikely that before long the lack of sufficient water will be keenly felt at various points along such waterways. If so, the general public will suffer.

Judge Cant's conclusions are as follows:

1. That as respects the waters in question, the Webster-Ashburton treaty of 1842 is still in force.
2. That such treaty prohibits the diversion of waters proposed by the petitioner.
3. That the permit granted by the Secretary of War for the diversion proposed was not authorized by law and is void.
4. That the successful prosecution of petitioner's enterprise would require the diversion of such a quantity of water as would substantially interfere with the present and future navigability and navigable capacity of the waterways in question.[1]

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[1] 148 N. W. R., p. 561.

SAND BEACHES, NORTH SHORE.

PART IV.

APPENDIX.

MEMORANDUM RE SHIPPING ON THE LAKE OF THE WOODS.

Year 1872.—First steam tug operated on the lake running from Fort Frances to Northwest Angle towing York boats. Estimated tonnage of tug not known, but stated to be of small size, with a draft of from 3 to 3½ feet. Boat owned and operated by Canadian Government.

Year 1873.—Operation of second Government tug of same size as first and engaged in same work. Construction of third Government boat, a side-wheeler, known as *Lady of the Lake;* draft, 5 feet; tonnage, 150; running from Fort Frances to Northwest Angle.

Years 1876–77.—Regular traffic by steamboat to Portage Bay (Kenora and Keewatin).

Year 1876.—Construction of *Speedwell.* First private owned boat operating on the lake. Draft, 4 feet; tonnage, about 20. Running from Fort Frances to Rat Portage and Northwest Angle, engaged in passenger and freight business. Wrecked on Wileys Reef in 1882.

Year 1879 or 1880.—Lily of the West. Government boat of screw-propeller type, portaged from Narokan Lake and engaged in carrying supplies from Rat Portage to Ash Rapids and Big Stone Bay. Draft, 4 feet; tonnage, 25 or 30.

Year 1879.—Steamer *N. Mosher.* Constructed and owned by Capt. Hooper. Running on same route as *Speedwell.* Draft, 5½ feet; tonnage, 33. Engaged in passenger and freight traffic. Wrecked about 1885 at mouth of Rainy River.

Year 1880.—Lilly McAuley, a side-wheeler; draft, 7 to 8 feet; tonnage, 121. Engaged in towing logs from various points around the lake. Machinery transferred from steamer *Lady of the Lake.* Renamed in 1884 *Mary Hatch.* Changed in 1886 to screw propeller.

Year 1881.—Mabel Von, towboat of 5-foot draft; tonnage, 20.

Year 1882.—Construction of towboat *D. L. Mather.* Draft, 8 feet; tonnage, 103. Scrapped in 1904. *Annie Mac,* tug and ferryboat, Rat Portage and Keewatin. Draft, 4 feet; tonnage, about 25. Scrapped about 1900.

Year 1883.—Couchiching, towboat; draft, 6½ to 7 feet; tonnage, 105. Scrapped 1897. *Fleetwing,* engaged in passenger traffic between Fort Frances and Rat Portage. Draft, 5 feet; tonnage, 40. Used about three or four years. Towboat *Algoma;* draft, 7 feet; tonnage, 99. Scrapped same year as steamer *Couchiching.* Towboat *Empress;* draft, 7 feet; tonnage, 129. *Queen;* used first as a private boat and later as a towboat. Draft, 5 feet; tonnage, 32.

Year 1886.—Kenina, engaged as a passenger boat and later as a ferry between Rat Portage and Keewatin. Draft, 5 feet; tonnage, 42.

Year 1887.—Highland Maid, engaged in passenger traffic, Fort Frances to Rat Portage. Draft, 5½ feet; tonnage, 106. Wrecked at Sault Rapids in 1904.

Year 1888.—Towboat *Keewatin;* draft, 5 feet 6 inches; tonnage, 41. Destroyed by fire about 1903.

Year 1889.—Shamrock, passenger boat, running from Fort Frances to Rat Portage. Draft, 5 feet; tonnage, about 80. Still living. *Daisy Moore,* engaged in fishing industry. Draft, 5 feet; tonnage, 36.

Year 1893.—Minitonka, fish boat, constructed at Big Fork. Draft, 8 feet; tonnage, 68. Sunk in Rainy River in 1904. *Monarch*, side-wheeler, engaged in passenger traffic. Draft, 7 feet; tonnage, 167. Wrecked in Sault Rapids in 1895; salvaged by Rat Portage Lumber Co. and used as a towboat until 1907, when it was scrapped.

Year 1895.—Swallow, stern-wheeler, engaged in passenger traffic, Kenora to Fort Frances. Draft, 4½ feet; tonnage, about 128. Wrecked, 1896, on Big Traverse. *Edna Brydges*, passenger boat. Draft, 6 feet; tonnage, 176. Dismantled in 1904 and now running as *Forest B.*

Year 1896.—Van Horn, passenger boat. Draft, 5 feet; tonnage, 60. Portaged to Rainy Lake in 1898.

Year 1896–97.—Maple Leaf, passenger boat. Portaged to Rainy Lake.

Year 1897.—Steamer *Kenora.* Running from Kenora to Fort Frances.

Year 1900.—Albertan, passenger and freight boat, portaged from Rainy Lake. Draft, 4½ feet; tonnage, 25. Portaged back to Rainy Lake in 1902. *Agwinde*, passenger boat on Rainy River. Draft, 2 feet 6 inches; tonnage, 307. *Undine*, passenger boat. Draft, 3 feet; tonnage, 10.

NOTE.—Other than the above there were numerous boats engaged in towing and passenger traffic. These boats varied in size and draft. The names of a number of them are given herewith:

Ethel Banning (towboat).
Mikado (mining, draft 4 feet).
Squaw (mining).
Nora (passenger tug).
Sultana (mining).
Regina (mining).
Rambler (passenger tug).
Cruiser (tug).
Cairo (tug).
Enterprise (tug, tonnage 10).
Phantom (tug, tonnage 10).
Chieftain (fish and passenger tug, tonnage 10).
Thistle (passenger and fish tug).
Lottie S.
Scud.
Frank Marshall (fish boat).
Standard (fish boat).
Rover (fish boat).
Eagle.
Erin.
Margaret Quick.
Day Star.

Data relating to fishing industry, Lake of the Woods.

[Furnished by Mr. Paul Marschalk.]

Year.	Net weight of fish and caviar, total United States shipments.	Net weight of caviar.	Net weight of rough fish.[1]	Total value, price received by fishermen.
	Pounds.	*Pounds.*	*Pounds.*	
1905	[2] 600,000	.....	.....	.....
1906	[2] 700,000	.....	.....	.....
1907	[2] 1,000,000	.....	.....	.....
1908	[2] 1,000,000	.....	.....	.....
1909	[2] 1,100,000	729	120,986	$42,000.00
1910	1,110,000	724	225,940	47,000.00
1911	1,126,000	982	15,360	54,558.00
1912	1,546,861	1,124	167,922	69,565.00
1913	1,151,697	387	.....	53,038.53
1914	1,123,752	253	.....	49,716.95

[1] Gross weight equals double net weight.
[2] Estimated weights.

These figures do not include catch of Canadian fishermen operating out of Kenora.

Fish produced by Canadian fishermen operating out of Kenora, Ontario, during season of 1914.

[Given by Captain Johnson.]

	Pounds.
Whitefish	793,034
Yellow pike or pike perch	606,060
Pickerel or jackfish	373,025
Trout (lake)	27,336
Sturgeon	31,586
Tullibee	128,049
Suckers	50,942
Carp or Buffalo	120,730
Goldeyes	7,000
Skinned bullheads	64,990

Price received for above by fishermen, $84,675.

Fish produced by Canadian fishermen operating south of Grand Peninsula in 1914, including Bigsby Island fishery.

	Pounds.
Whitefish	19,614
Yellow pike	303,454
Pickerel	200,076
Sturgeon	4,663
Buffalo	51,154
Suckers	38,359
Goldeyes	28,539
Trout	702
Tullibee	355
Skinned bullheads	29,749

Price received for above fish by fishermen, $29,187.44.

Capital invested and men employed in fishing industry, Lake of the Woods.

[Data furnished by Mr. Paul Marschalk.]

Fishing station.	Number of men.	Number of boats.	Land.	Docks and buildings.	Value.			Total capital invested.
					Machinery, tools, etc.	Nets.	Boats.	
Mouth of Rainy, Marschalk and Zippel	9	4	$3,200	$1,800	$1,500	$3,000	$1,850	$11,350
Zippel, Wm. Zippel	5	2	2,000	1,800	300	1,600	600	6,300
Lude, J. Arneson	3	2	1,000	400	100	900	350	2,700
L. Neumiller	3	1	1,000	700	100	600	200	2,600
Arneson, B. Arneson	4	3	1,000	900	250	1,500	1,100	4,750
Springsteel Island, C. Springsteel	4	3	1,500	600	200	750	600	3,650
Elm Point, S. A. Selvog	5	2	600	900	350	1,900	900	4,650
Oak Island	16	6	2,500	2,000	3,000	5,000	3,300	15,800
Warroad, Armstrong Trading Co	10	2	(1)	3,600	500	.....	10,200	14,300
Warroad, S. A. Selvog	.....	.....	.....	900	.....	.....	.....	900
Bigsby Island (Canadian)	16	6	(2)	2,000	3,000	4,500	3,450	12,950
Total	.....	.....	.....	.....	.....	.....	.....	79,950

[1] Land and buildings.

[2] Leased.

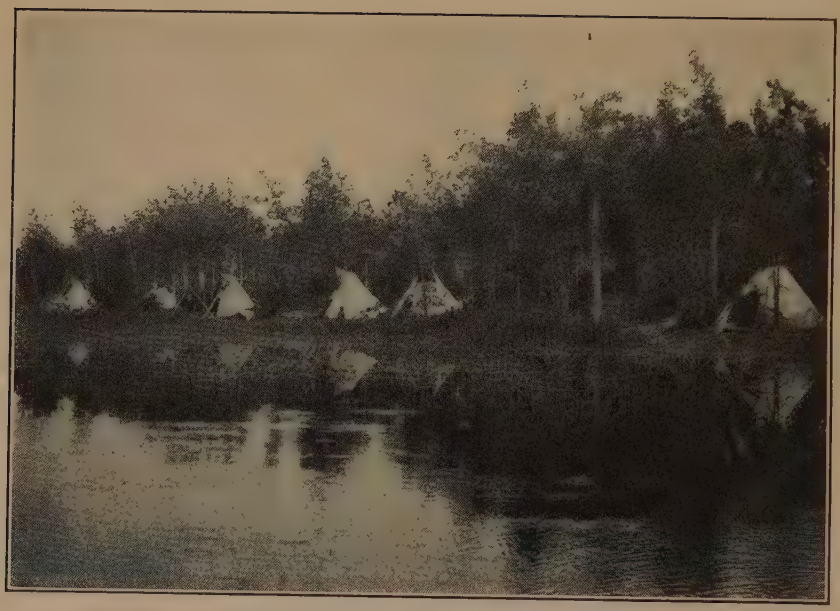
Canadian fishermen operating out of Kenora, Ontario, investment.

[Given by Captain A. Johnson, of Kenora.]

Boats, land, tools, nets:	
T. Gustafson	$10,000
William Andrews	5,000
Eric Holmstrom	9,000
August Holmstrom	6,000
Olaf Schens	6,000
Thomas H. Johnson	4,000
Magnus Lynardson	5,000
Charles Frier	3,000
S. Magnussen	2,500
George Moorhus	4,000
Arthur Johnson	2,000
Emiel Johnson	2,000
Armstrong Trading Co	30,000

Investment of Canadian fishermen operating south of the Grand Peninsula and shipping their fish to Warroad, Minn., or Rainy River, Ontario.

J. A. Budreau, boats, lands, tools, nets	$15,000
W. A. Boucha, boats, lands, tools, nets	$6,000
John Boucha, boats, lands, tools, nets	$4,000
Bigsby Island, fishery, Armstrong Trading Co	$12,950
Dominion Government hatchery at Kenora, Ontario:	
Cost of buildings and grounds	$48,000
Capacity of hatchery	90,000,000
Whitefish hatched during past winter (hatchery filled this spring with pike-perch spawn)	70,000,000
Wages paid to fishermen operating out of Kenora, about	$21,000
Wages paid to Canadian fishermen operating south of the Grand Peninsula, including Bigsby Island, about	$12,000



INDIAN CAMP ON NORTHWEST ANGLE.

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